Fishery Management Report No. 14-03

Fishery Management Report for Sport Fisheries in the Northwest/North Slope Management Area, 2012

by

Brendan Scanlon

February 2014

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat or long
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

FISHERY MANAGEMENT REPORT NO. 14-03

FISHERY MANAGEMENT REPORT FOR SPORT FISHERIES IN THE NORTHWEST/NORTH SLOPE MANAGEMENT AREA, 2012

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The Fishery Management Reports series was established in 1989 by the Division of Sport Fish for the publication of an overview of management activities and goals in a specific geographic area, and became a joint divisional series in 2004 with the Division of Commercial Fisheries. Fishery Management Reports are intended for fishery and other technical professionals, as well as lay persons. Fishery Management Reports are available through the Alaska State Library and on the Internet: http://www.adfg.alaska.gov/sf/publications/. This publication has undergone regional peer review.

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ABSTRACT

This report presents sport fisheries season summaries for 2012 and preliminary information for 2013 in the Northwest/North Slope Management Area. The Northwest/North Slope Management Area (NW/NSMA) consists of all waters north of the Yukon River drainage in Norton Sound, the Seward Peninsula, Kotzebue Sound (including the major drainages of the Kobuk and Noatak rivers), and all north-draining waters of the Brooks Range east to the Canadian border. Sport and subsistence fisheries target king, coho, chum, and pink salmon, Dolly Varden, sheefish, Arctic grayling, and northern pike. In 2012, angler-days totaled 20,079 with the largest proportion coming from the Seward Peninsula/Norton Sound fisheries (0.50). Coho salmon was the predominant sport species harvested in 2012 with 5,099 fish taken, followed by pink salmon (3,220) and Arctic grayling (2,038). Summaries of major sport, commercial, and subsistence fisheries within the NW/NSMA are detailed, including descriptions of recent performances, Alaska Board of Fisheries regulatory actions, social and biological issues, and descriptions of ongoing research and management activities.

Key Words: Northwest Alaska, Norton Sound, Kotzebue, Unalakleet, North Slope, sport fisheries, subsistence, king salmon, coho salmon, pink salmon, Arctic grayling, Dolly Varden, sheefish.

INTRODUCTION

This area management report provides information regarding the Northwest/North Slope Management Area (NW/NSMA) and is one in a series of reports annually updating fisheries management information within Region III. The report is provided for the Alaska Board of Fisheries (BOF), Fish and Game Advisory Committees (ACs), the general public, and other interested parties. It presents fisheries assessment information and the management strategies that are developed from that information. In addition, this report includes a description of a wide variety of information concerning Division of Sport Fish management programs within the area, including the fisheries regulatory process; the geographic, administrative, and regulatory boundaries; and funding sources.

The goals of the Division of Sport Fish of the Alaska Department of Fish and Game (ADF&G) are to protect and improve the state's recreational fisheries resources by managing for sustainable yield of wild stocks of sport fish, providing diverse recreational fishing opportunities, and providing information to assist the BOF in optimizing social and economic benefits from recreational fisheries. In order to implement these goals, the division has established a fisheries management process.

A regional review is conducted annually, during which the status of important area fisheries is considered and research needs are identified. Fisheries stock assessment projects are developed, scheduled, and implemented to meet information needs identified by fisheries managers. Projects are planned within a formal operational planning process. Biological information gathered from these research projects is combined with effort information and input from user groups to assess the need for and development of fisheries management plans and to propose regulatory strategies.

Division of Sport Fish management and research activities are funded by ADF&G and Federal Aid in Fisheries Restoration funds. ADF&G funds are derived from the sale of state fishing licenses. Federal aid funds are derived from federal taxes on fishing tackle and equipment that were established by the Federal Aid in Sport Fish Restoration Act (also referred to as the Dingell-Johnson Act or D-J Act). The D-J funds are provided to states at a match of up to 3-to-1 with the ADF&G funds. Additional funding specified for providing, protecting, and managing

access to fish and game is provided through a tax on boat gas and equipment established by the Wallop-Breaux (W-B) Act. Other peripheral funding sources may include contracts with various government agencies and the private sector.

This area management report provides information regarding the NW/NSMA and its fisheries for 2012, with preliminary information from the 2013 season. This report is organized into 2 primary sections. The first is a management area overview, including a description of the NW/NSMA and a summary of effort, harvest, and catch for the area. The second section discusses significant area fisheries, including specific harvest and catch by species and drainage.

The BOF divides the state into 18 regulatory areas to organize the sport fishing regulatory system by drainage and fishery. These areas (different from regional management areas) are described in Title 5 of the Alaska Administrative Code Chapters 47–74. The Division of Sport Fish of ADF&G divides the state into 3 administrative regions with boundaries roughly corresponding to groups of the BOF regulatory areas. Region I covers Southeast Alaska (the Southeast Alaska regulatory area). Region II covers portions of Southcentral and Southwest Alaska (including the Prince William Sound, Kenai Peninsula, Kenai River Drainage, Cook Inlet-Resurrection Bay Saltwater, Anchorage Bowl Drainages, Knik Arm Drainages, Susitna River Drainage, West Cook Inlet, Kodiak, Bristol Bay, and the Alaska Peninsula and Aleutian Islands regulatory areas). Region III includes Upper Copper River and Upper Susitna River area and the Arctic-Yukon-Kuskokwim Region (including the North Slope, Northwestern, Yukon River, Tanana River, and Kuskokwim-Goodnews regulatory areas).

Region III is the largest geographic region, encompassing the majority of the landmass of the state of Alaska (Figure 1). The region contains over 442,500 mi^2 (1,146,000 km^2) of land, some of the state's largest river systems (Yukon, Kuskokwim, Colville, Noatak, Upper Copper, and Upper Susitna River drainages), thousands of lakes, thousands of miles of coastline, and streams. Regional coastline boundaries extend from Cape Newenham in the southwest, around all of western, northwestern, and northern Alaska to the Canadian border on the Arctic Ocean. Region III as a whole is very sparsely populated, with the most densely populated area located in the Tanana River Valley. Fairbanks is the largest community with a population of about 35,000; the population of the greater Fairbanks North Star Borough is about 99,000.

For administrative purposes, the Division of Sport Fish has divided Region III into 5 fisheries management areas (Figure 1):

- Northwestern/North Slope Management Area (Norton Sound, Seward Peninsula, Kotzebue Sound, and North Slope drainages)
- Yukon Management Area (the Yukon River drainage except for the Tanana River drainage)
- Upper Copper/Upper Susitna Management Area (the Copper River drainage upstream of Canyon Creek and Haley Creek, and the Susitna River drainage above the Oshetna River)
- Tanana River Management Area (the Tanana River drainage)
- Kuskokwim Management Area (the entire Kuskokwim River drainage and Kuskokwim Bay drainages)

Area management biologists for the 5 areas are located in Nome/Fairbanks, Fairbanks, Glennallen, Fairbanks/Delta Junction, and Bethel/Fairbanks, respectively.

ALASKA BOARD OF FISHERIES

The BOF is a 7-member board that sets fishery regulations and harvest levels, allocates fishery resources, and approves or mandates fishery conservation plans for the State of Alaska. BOF members are appointed by the governor for 3-year terms and must be confirmed by the legislature.

Under the current operating schedule, the BOF considers fishery issues for regulatory areas or groups of regulatory areas on a 3-year cycle. Proposals to create new or modify existing regulations and management plans are submitted by ADF&G and the public (any individual can submit a proposal to the BOF) for evaluation by the BOF. During its deliberations the BOF receives input and testimony through oral and written reports from ADF&G staff, members of the general public, representatives of local ACs, and special interest groups such as fishing associations and clubs. Members of the public can respond to regulation changes and allocation by submitting written proposals and testifying directly to the BOF, by participating in local AC meetings, or by becoming members of local ACs.

ADVISORY COMMITTEES

Local ACs have been established throughout the state to assist the boards of Fisheries and Game in assessing proposed regulation changes and fisheries and wildlife issues. AC meetings allow opportunity for direct public interaction with ADF&G staff attending the meetings, where they are available to answer questions and provide clarification of proposed regulatory changes that affect resource issues of local and statewide concern. The Board Support Section within ADF&G's Division of Administrative Services provides administrative and logistical support for the BOF and ACs. During 2012, ADF&G had direct support responsibilities for 82 ACs in the state.

Within the NW/NSMA, there are 9 ACs: the Arctic, Kotzebue, Lower Kobuk, Noatak/Kivalina, Northern Norton Sound, Northern Seward Peninsula, St. Lawrence Island, Southern Norton Sound, and Upper Kobuk committees. In addition, ACs from the Yukon River drainage occasionally comment on proposals concerning Northwest fisheries.

RECENT BOARD OF FISHERIES ACTIONS

The BOF meets annually but deliberates on each individual regulatory area on a 3-year cycle. The most recent meeting for the NW/NSMA took place in January 2013 in Anchorage. At this meeting, the BOF adopted a proposal reopening the sport fishery for chum salmon in the Nome Subdistrict, which includes all marine and fresh waters between Cape Rodney and Topkok Head except the Penny and Cripple rivers, which remained closed to sportfishing for chum salmon. At the January 2010, meeting the BOF adopted a housekeeping proposal involving the NW/NSMA. This proposal aligned the sport fish regulatory boundaries for the Yukon River, Northwestern, and North Slope management areas with the subsistence and commercial regulatory areas. This action did not change any specific drainage regulations, however, because the background regulations for all species in these areas were the same.

ADF&G EMERGENCY ORDER AUTHORITY

ADF&G has emergency order (EO) authority (5 AAC 75.003) to modify time, area, and bag/possession limit regulations. EOs are implemented to deal with conservation issues for resident species. EOs are also implemented as a tool for inseason management of salmon

fisheries. Inseason management is usually carried out in accordance with a fisheries management plan approved by the BOF. EOs issued under this authority for the NW/NSMA during 2012 are summarized in Appendix A.

FEDERAL SUBSISTENCE

The Alaska National Interest Lands Conservation Act (ANILCA) established a priority subsistence use of fish and game for federally qualified rural residents on lands and waters for which the federal government asserts jurisdiction. The State of Alaska has also established a priority for subsistence use of fish and game by Alaska residents (AS 16.05.258) on all lands and waters but cannot discriminate between rural and urban residents (Alaska State Constitution Article VIII, sections 3 and 15). Because of this difference, the federal government asserted authority to ensure a priority subsistence use of fish and game for rural residents on federal lands and certain adjacent waters. On October 1, 1999, the federal government asserted regulatory authority for assuring the rural priority for subsistence fisheries on federal public lands, which includes nonnavigable waters on public lands. Following the *State of Alaska v. Katie John* decision by the Ninth Circuit Court in 1995, the federal government expanded the definition of public land to include waters for which the federal agencies assert federal reserved water rights. Under current practice, the federal land-management agencies adopt regulations to provide for the priority subsistence use by qualified rural residents in nonnavigable waters within federal public lands (including Bureau of Land Management [BLM] lands) and in navigable waters adjacent to or within federal conservation system units (generally does not include BLM lands). The state retains all other fish and wildlife management authorities, including management on federal land.

Development of regulations for subsistence fisheries under the federal subsistence program occurs within the established Federal Subsistence Board (FSB) process. The public provides input concerning regulation changes by testifying in Federal Subsistence Regional Advisory Council (RAC) meetings or by becoming council members. Ten RACs have been established throughout Alaska to assist the FSB in determining local subsistence issues and providing recommendations on proposed fishing and hunting regulations that affect the fish and game populations under consideration. Each RAC meets twice a year, and subsistence users and other members of the public can comment on subsistence issues at these meetings.

Within the NW/NSMA, the subsistence fisheries for which the federal government asserts management responsibility include those within and adjacent to the Bering Land Bridge National Preserve, Selawik National Wildlife Refuge, Kobuk Valley National Park, Noatak National Preserve, Cape Krusenstern National Monument, Alaska Maritime National Wildlife Refuge, Gates of the Arctic National Park, and the Arctic National Wildlife Refuge. The Unalakleet Wild and Scenic River (wild classification only) is under federal fisheries management, but only from the headwaters down to the Chiroskey River. In addition, portions of the Kobuk, Noatak, Salmon, and Selawik rivers are designated as Wild and Scenic Rivers (wild classification only). The NW/NSMA fisheries fall under the purview of the Seward Peninsula, Northwest, and North Slope RACs. The most recent meetings were held in August (North Slope RAC), September (Northwest RAC), and October 2013 (Seward Peninsula RAC). No fisheries-related proposals were addressed by the RACs in 2012. However, at the 2008 Seward Peninsula RAC meeting, that council supported a proposal to close the federal public waters of the Unalakleet River drainage (upstream from the mouth of the Chiroskey River, or approximately 23 river miles from

the village) to the taking of king salmon, in response to concerns regarding the harvesting of king salmon on the spawning grounds. The RAC's recommendation of support was forwarded to the FSB, and the proposal was adopted by the FSB in March 2009. A listing of the addresses and telephone numbers for these federal management units can be found in Appendix B.

REGION III DIVISION OF SPORT FISH RESEARCH AND MANAGEMENT STAFFING

The Region III Division of Sport Fish staff biologists are organized into a research group and a management group. The management group consists of a management supervisor, a regional management biologist, an area biologist for each of the 5 management areas, 1 or more assistant area management biologists, and 2 stocked water biologists. Area biologists evaluate fisheries and propose and implement management strategies through plans and regulation in order to meet divisional goals. A critical part of these positions is interaction with the BOF, ACs, and the general public. Stocked waters biologists plan and implement the regional stocking program for recreational fisheries. The regional management biologist assigned to the Region III headquarters office in Fairbanks also administers the regional fishing and boating access program.

The research group consists of a research supervisor, a salmon research supervisor, a resident species supervisor, research biologists, and various field technicians. Research biologists plan and implement fisheries research projects in order to provide information needed by the management group to meet divisional goals. The duties of the management and research biologists augment one another.

STATEWIDE HARVEST SURVEY

Sport fishing effort and harvest of sport fish species in Alaska have been estimated and reported annually since 1977 using a mail survey (Mills 1986). The Statewide Harvest Survey (SWHS) is designed to provide estimates of effort, harvest, and catch on a site-by-site basis. It is not designed to provide estimates of effort directed toward a single species. Species-specific catch-per-unit-effort (CPUE) information can seldom be derived from the report. Questionnaires are mailed to a stratified random sample of households containing at least 1 individual with a valid fishing license (resident or non-resident). Information gathered from the survey includes participation (number of anglers and days fished), number of fish caught, and number harvested by species and site. These surveys estimate the number of angler-days of fishing effort expended by sport anglers fishing in Alaska waters, as well as the sport harvest (Mills 1987-1993). Beginning in 1990, the survey was modified to include estimation of catch (release plus harvest) on a site-by-site basis. Survey results for each year are available the following year; hence, the results for 2012 were available in fall 2013. Additionally, creel surveys have been used to verify the mail survey for fisheries of interest or for fisheries that require more detailed information or inseason management.

The utility of SWHS estimates depends on the number of responses received for a given site (Mills and Howe 1992; Clark 2009). In general, estimates from smaller fisheries with low participation are less precise than those of larger fisheries with high participation. Therefore, the following guidelines were implemented for evaluating survey data:

1. Estimates based on fewer than 12 responses should not be used other than to document that sport fishing occurred;

2. Estimates based on 12 to 29 responses can be useful in indicating relative orders of magnitude and for assessing long-term trends; and,
3. Estimates based on 30 or more responses are generally representative of levels of fishing effort, catch, and harvest.

For purposes of reporting and organizing statistics in the SWHS, the Seward Peninsula/Norton Sound, Northwest Alaska, and North Slope areas are designated as survey areas W, X, and Z.

SPORT FISH GUIDE LICENSING AND LOGBOOK PROGRAM

Since 1998, the Division of Sport Fish has operated a program to register and/or license both sport fishing guides and sport fishing guide businesses, and to collect information on sport fishing participation, effort, and harvest by saltwater and freshwater guided clients (Sigurdsson and Powers 2009). In 1998, the BOF adopted statewide sport fishing guide regulations (5 AAC 75.075) that required all sport fishing guides and businesses to register annually with ADF&G. At this time, the BOF also adopted statewide regulations that required logbooks for saltwater charter vessels. The logbooks collected information on charter activity (location, effort, and harvest) that was necessary for the BOF for allocation and management decisions specific to king salmon (*Oncorhynchus tshawytscha*), rockfish (*Sebastes* spp.), and lingcod (*Ophiodon elongatus*) and for the North Pacific Fishery Management Council (NPFMC) for allocation of Pacific halibut (*Hippoglossus stenolepis*).

In 2004, the Alaska Legislature adopted House Bill 452, which established licensing requirements for sport fishing guide business owners and sport fishing guides on a statewide basis (effective 2005). This legislation also required logbook reporting for all freshwater guiding businesses, in addition to the existing saltwater reporting requirements. The logbook data provides location of fishing effort, level of participation, and number of species kept and released by clients. This information is used for the regulation, development, and management of fisheries and has been published annually since 2009 (data since 2006) in a Fishery Data Series report (Sigurdsson and Powers 2009-2013).

For the years 2006–2012, a total of 6,746 guided anglers fished in the NW/NSMA, with the largest percentage fishing in the Seward Peninsula/Norton Sound area (83%). The total number of guided anglers that have fished the NW/NSMA is less than 1% of the statewide total for 2006–2012 (888,223 anglers; Sigurdsson and Powers 2009-2013).

SECTION I:
NORTHWEST/NORTH SLOPE MANAGEMENT AREA OVERVIEW

MANAGEMENT AREA DESCRIPTION AND FISHERIES RESOURCES

The NW/NSMA includes all waters north of the Yukon River drainage in Norton Sound, the Seward Peninsula, Kotzebue Sound (including the major drainages of the Kobuk and Noatak rivers), and all north-draining waters of the Brooks Range east to the Canadian border (Figures 2–6). The total land area consists of approximately 147,992 mi^2 (383,301 km^2). Located within the NW/NSMA are the communities of Barrow, Point Hope, Kivalina, Noatak, Kotzebue, Noorvik, Kiana, Ambler, Shungnak, Kobuk, Selawik, Buckland, Deering, Shishmaref, Nome, Teller, Brevig Mission, White Mountain, Golovin, Elim, Koyuk, Shaktoolik, Unalakleet, St. Michael, and Stebbins. Access to most of the communities and water bodies is limited to aircraft or boat. Three roads around Nome provide access to Teller (Nome-Teller Highway), the Kuzitrin River drainage (Nome-Taylor Highway), and Council (Nome-Council Road; Niukluk-Fish river drainages).

Fish species present in the NW/NSMA include anadromous Dolly Varden *Salvelinus malma*; king, coho *O. kisutch*, chum *O. keta*, sockeye *O. nerka*, and pink salmon *O. gorbuscha*; Bering cisco *Coregonus laurettae*; and humpback whitefish *C. pidschian*. Also present are freshwater-resident Arctic grayling *Thymallus arcticus*, Dolly Varden, Arctic char *S. alpinus*, northern pike *Esox lucius*, sheefish *Stenodus leucichthys*, round whitefish *Prosopium cylindraceum*, least cisco *C. sardinella*, humpback whitefish, broad whitefish *C. nasus*, burbot *Lota lota*, and lake trout *S. namaycush*.

Norton Sound/Seward Peninsula Subarea

Drainages in southern Norton Sound (Figure 3) include the Golsovia, Unalakleet, Egavik, Shaktoolik, Inglutalik, Ungalik, and Koyuk rivers. All but the Koyuk River drain the Nulato Hills, which separate Norton Sound from the Yukon and Koyukuk river valleys. Of these, the Unalakleet River is the largest and most heavily utilized. The village of Unalakleet is located at the mouth of this river. The Unalakleet River has been designated a National Wild River, and it supports anadromous populations of Dolly Varden; king, coho, chum, and pink salmon; and resident populations of Dolly Varden, Arctic grayling, and whitefishes *Coregonus* sp. Other area streams provide the opportunity for high-quality fisheries for the same species but are not as intensively fished because of their remote nature and difficult access.

Many streams located along the southern half of the Seward Peninsula between Koyuk and Teller (Figure 4), including the Fish, Niukluk, Eldorado, Nome, Snake, Sinuk, Feather, Tisuk, Pilgrim, and Kuzitrin rivers, are accessible via the Nome road system and offer sport fishing opportunity for Arctic grayling, Dolly Varden, salmon, and northern pike (northern pike are found in the Fish, Pilgrim, and Kuzitrin rivers). Small sockeye-salmon runs have historically occurred in the Pilgrim and Sinuk rivers, although these runs increased markedly from 2003–2008. Based on counting-tower and weir information, a few remnant late-run sockeye salmon are present in other locations in Norton Sound. King salmon are present in the Pilgrim, Niukluk, and Fish rivers. Trophy Arctic grayling, larger than 3 lbs (1.4 kg), are present in many Seward Peninsula waters. Of the 444 Arctic grayling registered in the ADF&G trophy fish program since 1967, 61 were taken from Seward Peninsula waters, and 26 of those were taken

from the Sinuk River. The new state record Arctic grayling (5 lb 3 oz) was caught and released from the Fish River drainage in 2008. Remote streams such as the Koyuk, Tubutulik, Kwiniuk, and Agiapuk rivers are accessible by aircraft or boat from nearby villages. These rivers receive little sport fishing effort but provide opportunity for remote high-quality fisheries. Scanlon and DeCicco (2007) provide more detail on these fisheries and other remote systems.

Kotzebue Sound/Chukchi Sea Subarea

Major drainages flowing into the Kotzebue Sound and Chukchi Sea include the Selawik, Kobuk, Noatak, Wulik, Kivalina, and Buckland rivers (Figure 5). The Noatak River is a National Wild River, and most of the drainage is included in the Noatak National Preserve (Figure 5). The extreme upper headwaters of both the Noatak and Kobuk rivers are included in Gates of the Arctic National Park. A portion of the lower Kobuk Valley, between the villages of Kiana and Ambler, is included in the Kobuk Valley National Park. The Salmon River, the upper mainstem of the Kobuk River, and the Selawik River are also National Wild Rivers. Much of the Selawik River valley is part of the Selawik National Wildlife Refuge.

The Noatak River Drainage supports resident populations of whitefish, Arctic grayling, Dolly Varden, lake trout, burbot, and northern pike. Sheefish use the lower reaches of the river for feeding during the spring but are not known to spawn there (Alt 1987). This system is known for its trophy-size Dolly Varden. Many thousands of anadromous Dolly Varden overwinter in the lower 200 miles (300 km) of the river and spawn in some of the river's tributary streams. The Noatak River produces a large run of chum salmon that contributes to a Kotzebue-based commercial fishery. During the commercial salmon fishery in August, a significant incidental harvest of adult Dolly Varden can occur.

The Kobuk River contains the largest spawning population of sheefish in northwestern Alaska. Sheefish migrate more than 300 miles to spawn in the upper reaches of the drainage. Hotham Inlet, Selawik Lake, and the delta system at the river's mouth serve as winter feeding areas for juvenile and adult sheefish. The Alaska state record sheefish, 53 lb, was taken in 1986 from the Upper Kobuk River. Abundant numbers of whitefish utilize the river, as well as Selawik Lake and Hotham Inlet (known locally as Kobuk Lake). Whitefish support important subsistence fisheries in villages along the river. Dolly Varden, northern pike, Arctic grayling, burbot, lake trout, and Arctic char inhabit various parts of the Kobuk River watershed.

The Selawik River also supports a spawning population of sheefish that shares rearing and winter feeding areas with the Kobuk River population. Sheefish in both populations grow more slowly, live longer, and attain a larger size than those in other areas of Alaska (Alt 1987). The Selawik River drainage and associated wetlands provide abundant habitat for whitefish and northern pike.

Other important waters include the Wulik and Kivalina rivers that drain into the Chukchi Sea near the village of Kivalina. These drainages provide rearing, spawning, and wintering habitat for diadromous Chukchi Sea Dolly Varden. The Alaska state record Dolly Varden, 27 lb 6 oz, was taken in 2002 from the Wulik River. All 5 species of North American Pacific salmon, Arctic grayling, burbot, and whitefish occur in these relatively small drainages; however, except for chum salmon in the Wulik River, most populations of these other species are small.

North Slope Area

The North Slope of the Brooks Range (Figure 6) includes all waters north of the Brooks Range flowing into the Beaufort and Chukchi seas from Point Hope on the west to the Canadian border

on the east, including adjacent saltwater areas. Major drainages in this area include the Colville, Sagavanirktok, Canning, and Kuparuk rivers. These drainages provide rearing, spawning, and wintering habitat for diadromous Beaufort Sea Dolly Varden. The state's third largest lake, Teshekpuk Lake, is found here on the coastal plain, as are thousands of smaller lakes. Most of these lakes are inaccessible by road and too shallow to support fish populations, but there are dozens of lakes that contain lake trout, Arctic char, Arctic grayling, and burbot. These populations are generally slow-growing and are able to support only minimal harvests.

COMMERCIAL FISHERIES

Although small when compared to the major commercial fisheries in southeast and southwest Alaska, the commercial fisheries in northwest Alaska form an economic base for income and employment in many local communities. Commercial harvests of salmon, herring, halibut, and crab are usually much larger than sport harvests for those species (except on the North Slope, where currently there are no commercial fisheries for salmon, and consequently all references to commercial fisheries in this report refer to those in Norton and Kotzebue sounds). In addition, extremely limited commercial fisheries exist for freshwater species such as sheefish, Dolly Varden, and whitefish.

Commercial fisheries for salmon in the Norton Sound District have been ongoing since 1961. The initial species of interest were king and coho salmon, but commercial fisheries have since developed for chum and pink salmon. The district is divided into 6 subdistricts to facilitate management of individual stocks or stock groups. These subdistricts are 1) Nome, 2) Golovin, 3) Moses Point, 4) Norton Bay, 5) Shaktoolik, and 6) Unalakleet (Figure 7). Conservation concerns for chum salmon stocks have resulted in no commercially harvested chum salmon in the Nome Subdistrict since 1996. Average commercial harvests over the recent 5-year period (2007–2011) in the entire Norton Sound District were 102 king, 132 sockeye, 90,896 coho, 27,071 pink, and 61,995 chum salmon (Table 1). In 2012, commercial harvests in Norton Sound were 197 king, 134 sockeye, 37,056 coho, 205,498 pink, and 62,772 chum salmon. The 2012 pink salmon harvest was the largest recorded in Norton Sound since 1998 (Menard et al. 2013), but the coho salmon commercial harvest was well below those of recent years, due in part to severe weather throughout August limiting participation in the fishery (Scott Kent, Fishery Biologist, ADF&G, Nome, personal communication).

The Port Clarence District includes all waters from Cape Douglas north to Cape Prince of Wales, including the drainages of the Pilgrim and Kuzitrin rivers (Figure 7). Commercial salmon fishing has been prohibited in this district since 1967. Few stocks are present, and their run sizes are relatively small; however, the sockeye salmon run into Salmon Lake that passes through the district increased to an average of over 56,000 fish for the years 2003–2007 (Table 2). In 2007, due to these recent increases in sockeye salmon returns, a commercial fishery for sockeye salmon was permitted, with a guideline harvest limit of 10,000 sockeye salmon. Participation was low, however (3 permit holders), and catches of chum salmon exceeded sockeye salmon 3 to 1 (3,183 to 1,152; Soong et al. 2008). A precipitous decline in escapement followed 2008, and escapement has averaged just 4,635 fish/year since 2009 (Table 2).

The Kotzebue Sound District includes all waters from Cape Prince of Wales to Point Hope (Figure 8) and is the northern-most commercial fishing district in Alaska. The current commercial fishery opened under state management in 1962, but there are documented sales of salmon in the Kotzebue area dating back to the early 1900s. This is primarily a chum salmon

fishery with a few king salmon taken annually and an incidental take of Dolly Varden that pass through the fishery in August. Average commercial harvests 2007–2011 in the Kotzebue Sound District were 135,865 chum salmon and 606 Dolly Varden (Table 1; Menard et al. 2013). In 2012, the chum salmon harvest in the Kotzebue Sound District was 227,965 fish; this was the third year in a row in which over 200,000 fish were harvested (Table 1). There is also a directed under-ice commercial fishery on sheefish in Hotham Inlet. Documented annual harvests in this fishery have averaged fewer than 50 fish over the past several years, and the harvest quota of 25,000 pounds has never been met.

The Division of Commercial Fisheries conducts annual assessments of salmon escapements using weirs, counting towers, and aerial surveys. Weirs and towers are thought to provide more accurate measures of escapement than aerial surveys, and these methods have been expanded to cover more streams during recent years (Table 2). The status of Norton Sound chum salmon stocks of concern was reviewed by the BOF as part of the 2010 meeting cycle, and a biological escapement goal (BEG) for chum salmon based on combined weir, tower, and aerial survey counts in Nome Subdistrict streams was established. In addition, sustainable escapement goals (SEGs) have recently been developed for salmon stocks that lacked adequate data for the development of more formalized BEGs (Table 2). Currently, there are 25 escapement goals for Norton Sound area salmon stocks (10 for chum, 5 for king, 5 for pink, 3 for coho, and 2 for sockeye salmon; Munro and Volk 2013).

SUBSISTENCE FISHERIES

Approximately 27,000 people live in the NW/NSMA (US Census Bureau 2010). Except for the 2 larger communities of Nome and Kotzebue, the population is scattered among 31 small villages along the coast and the major area rivers. Most of the population is composed of Alaska Natives, many of whom rely heavily on the subsistence use of fish and wildlife for their livelihoods in a mixed market–subsistence economy. Although personal-use fisheries are also allowed, there has been no participation in these fisheries in the NW/NSMA, largely because all Alaska residents qualify as subsistence users. Subsistence harvests of salmon, Dolly Varden, sheefish, whitefish, and crab are very important to the livelihood of the many small villages in the NW/NSMA and are generally much larger than the sport fish harvests, which generally make up the smallest component of overall use in most years.

Subsistence use of salmon is monitored in village surveys conducted by ADF&G Division of Subsistence and by permits issued by and returned to the Division of Commercial Fisheries. Recent subsistence salmon harvests (2007–2011) have averaged about 60,000 fish in the Norton Sound District (Table 3). This average harvest was composed of 2,394 king, 527 sockeye, 12,956 coho, 32,283 pink, and 12,087 chum salmon. In 2012, 67,182 salmon were harvested in the Norton Sound District. Of these, 1,235 were king, 424 sockeye, 9,573 coho, 43,551 were pink, and 12,399 were chum salmon. The recent 5-year (2007–2011) average subsistence salmon harvest in the Port Clarence District was 12,047 fish, composed of 74 king, 3,726 sockeye, 602 coho, 3,738 pink and 3,907 chum salmon (Table 3; Menard et al. 2013).

In 2001, the BOF passed a regulation expanding legal gear for subsistence fishers to include a line attached to a rod or pole in all waters of northern Norton Sound from Cape Espenberg along the coast to Bald Head Point, which encompasses all waters of the Port Clarence District and the Nome and Golovin subdistricts (Figure 7). Although standard sport fishing gear can be used for subsistence fishing in these areas, sport fish methods and means regulations still apply (e.g., no

snagging in freshwater). Sport fish bag and possession limits by species as specified in 5 AAC 70.011 also apply, except when fishing through the ice or when a subsistence permit is required (such as in the Port Clarence District and the Nome and Golovin subdistricts), in which case the limits specified in the subsistence permit will apply. However, in all areas where sport gear is legal, subsistence gear is legal as well. Fishers cannot combine sport fish bag and possession limits with subsistence harvest permit limits.

The cyclic nature of salmon abundance in Norton Sound streams is apparent by the large variations in annual escapements (Table 2). In 2003, subsistence fishing opportunity in the Nome Subdistrict of Norton Sound was severely restricted because of low salmon abundance. In 2004, fishing opportunity was expanded because of abundant sockeye and pink salmon. In 2005–2007, higher-than-expected runs of chum salmon, in addition to abundant pink and sockeye salmon runs, allowed for a more relaxed subsistence fishing schedule. In 2008, chum salmon returns were down and restrictions were put in place for the subsistence fishery in the Nome Subdistrict; however, pink salmon escapements were near record highs in many areas (Table 2). Sockeye salmon escapements in the Pilgrim River, which averaged over 50,000 fish for the years 2003–2008, have only averaged 4,600 fish from 2009–2012 (Table 2; Menard et al. 2013). In addition to salmon, other fish are taken, including saffron cod, rainbow smelt, Dolly Varden, and whitefish. In the Kotzebue Sound District, the recent 10-year (2002–2011) subsistence salmon harvest has been about 16,000 chum salmon; however, subsistence harvest surveys for all species were not conducted in all 11 Kotzebue Sound District villages in all years, and therefore, these reported catches underestimate the total harvest by some unknown amount (Table 3). In 2007, the residents of Kivalina harvested a total of 4,568 chum salmon; however, this survey did not include villages along the Kobuk and Selawik rivers or the village of Kotzebue, and so total chum salmon harvests were probably much higher (Magdanz et al. 2010).

In the Kotzebue Sound District, sheefish and other whitefish species are also an important subsistence resource, especially in Kotzebue, Selawik, and the villages along the Kobuk River. The relative importance of whitefish is higher in the Kotzebue Sound District than in many other areas of the state, with much of the whitefish harvest including sheefish harvested by jigging through the ice in Hotham Inlet in the spring. The average subsistence harvest of whitefish for the village of Noatak and the 5 Kobuk River villages combined from 1998 to 2002 was 44,552 fish. In 2003, 73,242 whitefish were estimated harvested, and in 2004, 50,501 were estimated harvested (Fall et al. 2003; Brown et al. 2005; Georgette and Shiedt 2005).

ESTABLISHED MANAGEMENT PLANS AND POLICIES

Regulations governing fisheries in the NW/NSMA are found in 5 AAC 69.101 through 5 AAC 69.995 (North Slope Area sport fishing) and 5 AAC 70.001 through 5 AAC 70.995 (Northwestern Area sport fishing), and in 5 AAC 01.100 through 5 AAC 01.190 (subsistence fishing). The *Unalakleet River King Salmon Management Plan*, which encompasses sport, subsistence, and commercial regulations, is found in 5 AAC 04.395.

Fisheries-specific management objectives for the management area have been identified in management plans for Arctic grayling and lake trout. In addition, a series of general divisional criteria have been prepared to guide establishment of fishery objectives, including the following:

- **Management and protection of existing fish resources**. Divisional activities should strive to manage and protect Alaska's wild fish stock resources for future generations;

- **Public use and benefits of existing fish resources**. Alaska's fishery resources should be made available for public use and benefit on a sustained yield basis;
- **Rehabilitation of depressed stocks and damaged habitat**. Division activities should strive to restore and maintain fish stocks and habitat damaged by man's activities; and,
- **Enhancement of natural production or creation of new opportunities**. The division should pursue creation of new sport fishing opportunities through rehabilitation of natural stocks or creation of new fisheries where these opportunities do not negatively impact other fisheries.

Two regionwide management plans that affect fisheries in the area have been completed. A regional management plan for Arctic grayling was adopted by the BOF in January 2004. The *Wild Lake Trout Management Plan* was adopted for the Arctic-Yukon-Kuskokwim (AYK) region by the BOF in February 2007 (Burr 2006). Revision of existing plans, as well as the development of additional fisheries management plans, will occur as needed in response to changes in use patterns as new quantitative information becomes available.

The *Wild Arctic Grayling Management Plan* (5 AAC 69.155; 5 AAC 70.055) directs ADF&G to manage wild Arctic grayling populations in the NW/NSMA for long-term sustained yield through a conservative harvest regime. The plan establishes and defines 3 management approaches under which ADF&G shall manage wild Arctic grayling populations in the NW/NSMA: 1) the regional management approach; 2) the conservative management approach; and, 3) the special management approach. The plan also outlines guidelines and considerations for ADF&G, the public, and/or BOF to change or address the management approach for a water body or fish stock.

The *Wild Lake Trout Management Plan* (5 AAC 69.140; 5 AAC 70.040) directs ADF&G to manage wild lake trout populations in the NW/NSMA by employing a conservative harvest regime and by maintaining harvest below the maximum sustained yield level. ADF&G may take 1 or more management actions if there is a conservation or biological concern for the sustainability of the fishery or a stock harvested in that fishery. These actions include reduction of bag and possession limit, reduction of fishing time, allowing only catch-and-release, and modification of methods and means of harvest. The plan also specifies allowable measures to reduce harvest if the harvest level exceeds sustainable yield for a 2-year period. Finally, the plan establishes a process for designating special management waters and means for limiting harvest in these areas to meet the management objectives.

MAJOR ISSUES FOR THE NORTHWEST/NORTH SLOPE MANAGEMENT AREA

1. *Unalakleet River king salmon*. The Unalakleet River sustains the highest sport fishing effort of any single river in the NW/NSMA and supports the largest directed king salmon fishery in the area. In addition, the residents of Unalakleet and Shaktoolik depend heavily on king salmon for subsistence uses and, when escapements are large enough, income through a directed commercial fishery. Currently there is a sustainable escapement goal (SEG) for king salmon using an expansion of the tower counts on the North River (a large Unalakleet River tributary) of 1,200 to 2,600 fish. After a historic high of 4,185 fish in 1997, tower counts have declined steadily, and the counts have failed to reach the lower end of

the SEG for 6 out of the last 11 years recorded (2002–2012; Table 2). In 2008, the count was 903 fish, which was the all-time low until it was eclipsed in 2011 (864 fish). In 2012, the escapement again failed to reach the lower end of the escapement goal; the final tower count was 996 fish (Table 2). Uncertainty regarding the reasons for the declines in escapement, coupled with continued pressure from multiple user groups, makes the Unalakleet River king salmon stock a primary concern for fisheries managers in northwestern Alaska.

2. *Wulik River Dolly Varden*. Development of a world-class zinc deposit at the Red Dog site in the Upper Wulik River drainage carries the risk of heavy-metal contamination on one of the most important streams in Northwest Alaska for Dolly Varden. There has been concern that heavy-metal contamination of Red Dog and Ikalukrok creeks would occur both from natural leaching of the ore body as it was stripped for ore production and from discharge of contaminated waters into the river. A contamination problem in 1989 and 1990 has been controlled with additional wastewater treatment and the construction of a clean water bypass system in Red Dog Creek. Water quality is monitored by the Department of Natural Resources (DNR) and mine personnel. Contamination from dust along the road corridor has recently been documented by the National Park Service (NPS). In addition, final permits have been approved for expansion of the mine (called the Aqqaluk extension), which will extend the operational life of the mine from an original date for ore depletion of 2012 until 2031. The Division of Sport Fish conducts aerial surveys of Dolly Varden overwintering in the Wulik River annually and, in cooperation with the Division of Habitat, collects fish from which tissues are sampled for heavy metal analyses twice each year.

3. *Nome area gold mining*. The future development of large-scale lode deposits of gold near Nome has the potential to degrade fish habitat in the Snake, Cripple, and Solomon river drainages. Recently, a large increase in the number of recreational suction-dredging operations has occurred in the nearshore marine waters of the Nome Subdistrict, generating concerns over turbidity plumes and conflicts with subsistence fishers. Interest in mining is directly related to the world price of gold. Development interest had declined with the price of gold, but in the past 6 years, the number of mining operations has increased as the price has reached record-highs.

4. *Rural resentment of sport fishing and sport anglers*. At public meetings in this area, local residents sometimes express resentment toward "outsiders" who come into remote areas traditionally used by local people for subsistence hunting or fishing. They explain that there is a cultural proscription against the concept of sport fishing in that people do not have the right to "play" with food resources. This point of view can be particularly strong toward catch-and-release practices and has led to some resentment directed toward sport anglers who wish to fish in remote waters of NW/NSMA, and to proposals before the BOF that would have eliminated catch-and-release in some fisheries.

5. *Effects of federal subsistence fisheries management on sport fishing opportunity in the NW/NSMA*. In October 1999, federal fishery managers assumed responsibility for ensuring a rural subsistence priority on navigable waters adjacent to or within the boundaries of federal conservation units. There is continued concern that a result of

this action will be reduced opportunity for sport fishing throughout Alaska. Since there is a large amount of federal public land within the NW/NSMA that is used by local residents for subsistence purposes, the potential loss of sport fishing opportunity in remote areas of the NW/NSMA is of concern to anglers and sport fish managers. The ADF&G continues to work with federal managers and Federal Subsistence RACs to address fisheries issues as they arise.

ACCESS PROGRAM

The Wallop-Breaux Amendment to the Sport Fish Restoration Act (Dingell-Johnson or D-J) mandates that at least 15% of the federal funds collected from taxes on boat gas and sport fishing equipment be used by the states for the development and maintenance of motorized boating access facilities. A broad range of access facilities can be approved for funding if they are constructed to achieve a state fishery management objective. These facilities can include boat ramps and lifts, docking and marina facilities, breakwaters, fish cleaning stations, restrooms, and parking areas.

To date, few access projects have been proposed for the rural areas of the NW/NSMA; however, a boat launching facility was recently built in the village of Unalakleet using Access funds. In early 2010, a request from the city manager of Nome was submitted for a cooperative project with ADF&G to build a boat launch, parking area, and possibly a restroom facility on the mouth of the Snake River. However, it is unclear whether the city of Nome has the resources to maintain these facilities once they are built, and therefore, any further planning for this project has been suspended until this issue is resolved.

INFORMATION AND EDUCATION

Information regarding regulations, publications, stocking and fishing reports, news releases, and EOs for the NW/NSMA can be found by following the *Fishing* and then *Sport* links at the ADF&G website (http://www.adfg.alaska.gov/index.cfm?adfg=fishingSport.main). The *Interior Area* and *Northwest Drainages* sections on this website provide area descriptions, and at the *Fishing Information* and *Fishing Brochures* links, several Division of Sport Fish publications are available for download, including *Nome Roadside Fishing Guide*, *Sheefish Catch & Release* (for anglers interested in fishing the Kobuk or Selawik River drainages), and *Sport Fishing along the Dalton Highway* (for those interested in fishing along the roadside on the North Slope). Also, *Dolly Varden and Arctic Char in Northern Alaska* can be helpful for anglers who fish in the NW/NSMA, because both species are found in the area.

There are 3 regional information and education (I&E) staff located in the Fairbanks office. An Information Officer II and a seasonal Fisheries Technician III respond to questions from the public at the office and via phone and e-mail. In addition, I&E staff update the regional web page, distribute fishery brochures and fishing regulations, and coordinate the Fairbanks Outdoor Show booth, Kid's Fish & Game Fun Day, and the Becoming an Outdoors-Woman (BOW) program. An Education Associate II coordinates the sport fishing component of the Alaska Conservation Camp and works with schools in various communities throughout the region to provide a curriculum in sport fishing and aquatic education.

SPORT FISHING EFFORT, HARVEST, AND CATCH

Effort, harvest, and catch statistics for NW/NSMA sport fisheries have been estimated from responses to the SWHS since 1977 and reported under the headings of Seward Peninsula–Norton Sound Drainages (Area W), Northwest Alaska Drainages (Area X), and North Slope Drainages (Area Z) (Mills 1979-1980, 1981a-b, 1982-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b, *In prep*; Romberg et al. *In prep*). The results of the SWHS indicate that effort in the NW/NSMA has remained more or less stable since 1996; however, estimated annual sport fishing effort for 2010–2012 has been at its lowest level of participation in 20 years (Table 4). For the years 2010–2012, the total sport fishing effort for the NW/NSMA averaged 19,112 angler-days, more than 7,000 less than the prior 5-year (2005–2009) average of 26,591, with most of the decrease coming from Seward Peninsula waters (Table 4). The recent 5-year (2007–2011) average for sport fishing effort for the NW/NSMA is 25,143 angler-days (Table 4).

The Seward Peninsula and Norton Sound subarea supports most of the sport fishing effort in the NW/NSMA. Effort there has averaged 15,974 angler-days (64% of the area total) for the years 2007–2011 (Table 4). Rivers supporting the most sport fishing effort in the NW/NSMA have been the Unalakleet, Fish/Niukluk, and Nome rivers. Angler effort was estimated at 2,957 angler-days for the Unalakleet River in 2012, approximately 29% of the total effort in the subarea (Table 4). The Nome River has been closed to fishing for Arctic grayling and chum salmon since the early 1990s (although sport fishing for chum salmon reopened in 2013), and it is likely that these closures contributed to a reduction of fishing effort on this stream. Annual effort in the Nome River averaged 2,587 angler-days 2002–2011 but has averaged 3,004 for the years 2007–2011 (Table 4). The recent increases in effort are probably due to the recent large runs of pink and coho salmon present, as well as increased employment in the Nome area and the subsequent rise in the number of nonresident anglers that lived in Nome for the summer. The Fish/Niukluk river system has sustained an annual average of 3,144 angler-days of effort 2007–2011. Estimated effort on the Snake and Sinuk rivers has averaged about 1,123 and 668 angler-days respectively 2007–2011 (Table 4).

In the Kotzebue/Chukchi Sea subarea, sport fishing effort has been somewhat more variable, ranging from about 3,000 to 7,400 angler-days per year 2002–2011 (Table 4). In 2012, there were an estimated 4,970 angler-days in the subarea (Table 4). The large drainages of the Kobuk and Noatak rivers support more than 70% of the freshwater effort in this subarea during most years, and the remainder is dispersed among smaller drainages such as the Wulik, Kivalina, and Selawik rivers, and many of the area's lakes. Expense of travel, difficulty of access, and small human population probably account for the low levels of sport fishing effort reported in this region.

In the North Slope subarea, sport fishing effort is generally light but variable, with much of the effort focused on Dolly Varden, Arctic char, lake trout, and Arctic grayling in streams and lakes along the Dalton Highway (North Slope Haul Road) where access is less difficult. The average effort for the years 2002–2011 was 4,048 angler-days, with almost 50% of that coming from Haul Road fisheries (Table 4). In 2012, sport fishing effort was 5,057 angler-days with over 70% of the effort directed at Haul Road fisheries.

Harvest and catch of Pacific salmon were both down from the recent 10-year averages, driven primarily by the absence of king salmon harvest in 2012 and a decrease in coho salmon harvest

from recent highs (Tables 5 and 6). Salmon harvest in 2012 was 9,038 fish, 25% less than the recent 10-year average of 11,298 fish, with king salmon harvest (0 fish) well below the average of 376 fish per year (Table 5). The Unalakleet River has provided for 70% of the harvest and 72% of the catch of king salmon in the NW/NSMA in the past 10 years. With low escapement and consequent early season closure of the sport fishery by EO in 2012 (Appendix A), no fishing was allowed for king salmon beginning July 11. Catches of Pacific salmon in the NW/NSMA in 2012 were 20,979 fish, down 51% from the recent 10-year average of 41,338 (Table 6). Much of the decrease can be attributed to heavy rains and high water in most areas of Norton Sound throughout the summer, which caused difficult fishing conditions, particularly in August when coho salmon fishing is at its peak. This is reflected in tower and weir counts throughout Norton Sound, which were unable to operate during most of August and consequently counted very few coho salmon (Table 2).

Harvest and catch of Arctic grayling and Dolly Varden were also down considerably in 2012 compared to recent averages. Harvest of Dolly Varden was down 67% in 2012 (1,627 fish) compared to the recent 10-year average of 4,984 fish. Similarly, harvest of Arctic grayling dropped 31% in 2012 (2,038 fish) from the recent 10-year average of 2,941 fish (Table 5). Catch of Dolly Varden in 2012 fell from recent 10-year averages, while catch of Arctic grayling remained near the recent 10-year average. Catches of Dolly Varden were 11,890 in 2012 and of Arctic grayling were 25,459, compared to recent 10-year averages of 18,504 and 24,883 fish, respectively (Table 6).

Harvest and catch of other non-salmon species in 2012 remained fairly low or close to recent 10-year averages (Tables 5 and 6). More detailed descriptions of specific important fisheries by location and species can be found in Section II.

SECTION II:
MAJOR NORTHWESTERN AND NORTH SLOPE AREA FISHERIES

NW/NSMA waters offer some of the most remote and diverse angling opportunities available in Alaska. Opportunities to fish for Dolly Varden, sheefish, and Arctic grayling in pristine areas without encountering other anglers are widespread. Angling opportunities for salmon, especially chum, pink, and coho salmon, are not as well known but can be excellent. Marine sport fisheries have been virtually nonexistent throughout the area, although in Norton Sound, anglers occasionally try trolling for salmon (king, coho, and pink) on calm days. The proportion of angler-days spent fishing in saltwater is generally less than 5% of the total annual areawide effort. Jigging through the ice for saffron cod, smelt, flounder, sheefish, Arctic grayling, and Dolly Varden is common near coastal settlements, but these fisheries generally operate under subsistence fishing regulations.

This section provides a summary of significant sport fisheries by species in the NW/NSMA in 2012 and 2013. Discussion of each fishery will address 1) a historical perspective, 2) recent fishery performance (stock status), 3) fishery objectives and management, 4) current issues, 5) recent actions by the board, and 6) ongoing and recommended management and research activities. Recent fishery performance will focus on data from 2012. Information regarding the 2013 season will be included as available, but estimates of sport effort and harvest are not yet available for the 2013 season.

NORTHWESTERN ALASKA SALMON FISHERIES

Sport fishing for salmon takes place throughout the management area. However, the vast majority of salmon fishing occurs in the Seward Peninsula/Norton Sound subarea, with concentrated effort near Unalakleet and in waters accessible from the Nome area road system. Some salmon-fishing effort occurs in association with wilderness float trips in Kotzebue Sound drainages, but the amount of sport fishing effort expended toward salmon in the northern part of the management area is very light and harvests are very small.

During the recent 5-year study (2007–2011), about 62% of the total average salmon harvest has been coho, 24% pink, 11% chum, 2% king, and 1% sockeye salmon. In 2012, 56% of the total salmon harvest was coho, 36% pink, 8% chum, <1% sockeye, and 0% king salmon (Table 5).

UNALAKLEET RIVER SALMON FISHERIES

Background and Historical Perspective

The village of Unalakleet, with a population of about 800, is located on the shore of Norton Sound at the mouth of the Unalakleet River. Daily air service from Anchorage and Nome provides access for anglers visiting the Unalakleet area. The Unalakleet River supports substantial runs of king, chum, coho, and pink salmon. Most of the angling effort on the Unalakleet River is directed toward king and coho salmon, but other species of salmon, Arctic grayling, and Dolly Varden are also targeted. The king salmon run usually begins in mid-June, peaks during the first week of July, and continues through late July. Anglers access the river by boat from the village of Unalakleet and are composed of a mix of local residents, visitors who rent boats or fish with friends, and visitors who stay at 1 of the 2 sport fishing guide operations

on the river. Most sport fishing effort occurs in the lower 15 miles of the Unalakleet River and in the lower 5 miles of the North River, a tributary that enters the Unalakleet River about 7 miles upstream from its confluence with the Bering Sea. Sport fishing for king salmon in the Unalakleet River is popular with both local residents and guided and nonresident anglers. Generally, about 60% of the king salmon harvested from the river each year are taken by local residents.

There are 2 private lodges on the Unalakleet River, upstream of the North River, that provide guided fishing trips for salmon, Dolly Varden, and Arctic grayling. The U.S. Air Force operated a sport fishing recreational camp on the Unalakleet River, 8 miles upstream of the village, during the 1960s. A commercial sport fishing lodge was constructed there in the late 1960s, and the Unalakleet Native Corporation owned the lodge for several years and contracted operations. This lodge is currently in private ownership and can accommodate up to 15 clients at one time. The other, smaller operation generally has 2-6 clients at one time and focuses primarily on fishing for coho salmon in August. Local residents guide anglers on the river, and guiding operations from the Yukon River drainage will sometimes visit the river during the peak of the king and coho salmon runs. However, the majority of angling on the Unalakleet River is by unguided anglers. An unpublished survey by the Division of Sport Fish in the 1990s estimated that only about 8.5% of salmon anglers on the Unalakleet River were guided. Based on estimated effort levels from the SWHS and known effort by the guiding businesses via the guide logbook program, it is likely that guiding currently accounts for about 25% of the total angling effort on the Unalakleet River.

Recent Fishery Performance

Since 1995, the Unalakleet River has sustained the highest sport fishing effort of any single river in the NW/NSMA in all but 5 years. The 2002 effort was the highest on record at 8,195 angler-days, and effort for the years 2007–2011 averaged 4,320 angler-days (Table 4). Unalakleet River salmon harvests trended upward between 1991 and 2000 and remained relatively stable until 2008, when a record number of salmon were harvested (8,861 fish), principally pink and coho salmon (Tables 7–10). In 2012, the harvest of all salmon species was 5,886 fish, and the average annual sport harvest of all salmon species from the Unalakleet River for the years 2007–2011 was 5,323 fish. Coho salmon comprised about 78% of the average harvest, while king salmon made up about 4%. Approximately 56% of the entire NW/NSMA harvest of coho and chum salmon were taken from the Unalakleet River in 2012, while no king salmon were estimated to be harvested from the Unalakleet drainage for the first time since the inception of the SWHS in 1977 (Tables 7 and 8; Scanlon and DeCicco 2007).

Estimated sport harvest of king salmon in the Unalakleet River remained fairly stable from 1993 to 2002, averaging about 431 fish annually. For the years 2003–2009, king salmon harvest averaged 291 fish per year (Table 7). This decline in harvest was most likely a result of king salmon restrictions (no retention effective the first or second week of July) in 6 of the 7 years during this period. In 2008, estimated harvest increased to 580 fish; however, this number may be inflated because 1 respondent reported catching and harvesting 32 “jack” king salmon (<20 inches) in a year with record low escapement (903 fish counted at the North River tower). This response seems very unlikely, and these fish were probably Dolly Varden or pink salmon. The harvest estimate for king salmon ≥20 inches was 108 fish, a reasonable number considering the small size of the escapement and the harvests from recent years. There were no king salmon

harvested from the Unalakleet River drainage or anywhere else in the NW/NSMA in 2012 (Table 7).

There have been no directed commercial fishing openings for king salmon since 2001 in the Unalakleet Subdistrict (Menard et al. 2013). Unalakleet and Shaktoolik king salmon stocks were designated as "stocks of concern" by the BOF in January 2004. King salmon subsistence harvests in Unalakleet have ranged from 90 fish in 1966 to 4,191 fish in 1997 (Menard et al. 2013). The recent 5-year average (2007–2011) harvest was 1,365 fish. The sport fish harvest over the same 5-year period averaged 218 king salmon (Table 7), about 5% of the total Unalakleet salmon harvest. The 2012 subsistence harvest was estimated at 808 king salmon. In 2012, no king salmon were reported harvested in the sport fishery, and only 17 were reported being caught (Tables 6 and 7).

In 2012, it was projected that the North River would not reach the lower end of its escapement goal (1,200–2,600 king salmon) based on low catches of king salmon in the Division of Commercial Fisheries' test net in the Unalakleet River and the North River tower count of 90 fish on July 7. As a result, EO-3-KS-06-12 prohibited the retention of king salmon and eliminated the use of bait while sport fishing in the Unalakleet and Shaktoolik rivers. This EO was in effect from July 11 until August 15, 2012 (Appendix A). The final count on the North River was 996 king salmon, below the lower end of the escapement goal.

Coho salmon are the most sought-after salmon species in the Unalakleet drainage. The run usually begins around August 1, peaks during mid-August, and continues through mid-September. Estimated sport harvest of coho salmon in the Unalakleet River has averaged 4,134 fish for the years 2007–2011, including a record-high of 6,029 fish in 2008 (Table 8). In 2012, 3,283 coho salmon were harvested, well below recent 5- and 10-year averages (Table 8). Approximately 40% of coho and king salmon caught are harvested, while about 5% of chum and 17% of pink salmon (2007–2011 average) caught are harvested (Tables 7–10).

From 2007 to 2011, commercial harvests of coho salmon in the Unalakleet Subdistrict have averaged 57,646 fish (Menard et al. 2013). During the same period, subsistence harvests of coho salmon in the community of Unalakleet averaged 5,300 fish. The 2012 subsistence harvest was estimated at 4,558 fish (Menard et al. 2013). Rainy weather during coho season coupled with above-average chum salmon harvests may have contributed to the below-average coho salmon harvests in 2012 (S. Kent, ADF&G, Nome, personal communication).

Historic escapement data for coho salmon in the entire Unalakleet River drainage are not available. Information on the proportion of the run that spawns in the mainstem Unalakleet River was not available until recently; however, counting-tower numbers from the North River probably give an indication of recent run strength. Based on the tower counts, the 2005 and 2007 escapements were over twice the size of the 2004 and 2006 escapements (Table 2). In 2009, the escapement was the highest on record with 22,226 fish past the counting tower. In both 2011 and 2012, tower counts of coho salmon were well below recent counts; however, in both years the tower was inoperable due to high water for several days during the historical peak of the coho salmon run (Menard et al. 2013).

Fishery Objectives and Management

Prior to 2007, there were no specific management objectives identified for salmon fisheries on the Unalakleet River. In 2007, the BOF adopted the *Unalakleet River King Salmon Management*

Plan, which mandates inseason management actions in the subsistence, sport, and commercial king salmon fisheries to achieve the escapement goal based on North River tower count projections. In 2007, a revised North River king salmon sustainable escapement goal (SEG) of 1,200 to 2,600 fish was established. The management goal in the Unalakleet River is to maintain adequate escapements of king salmon into the system that will support utilization by the various user groups.

Current Issues and Fishery Outlook

Although sport fishing has been ongoing in the Unalakleet River drainage for many years, there is some local resentment of visiting anglers, represented by a few Unalakleet residents who expressed the point of view during local AC meetings that "outsiders" are competing for the local salmon resources. Previous declines in chum and coho salmon runs throughout Western Alaska affected the Unalakleet River drainage, although the effect appears to be less dramatic than in Nome Subdistrict streams, where chum salmon runs have a long history of decline. Recent increases in escapements suggest that coho and chum salmon returns in the Unalakleet River are at more acceptable levels, particularly for coho salmon (Table 2). While the commercial harvests of king salmon in the Unalakleet Subdistrict have been minimal during the past 9 years, sport harvests have stayed fairly consistent.

The upper reaches of the Unalakleet River (from the Chiroskey River to the headwaters) is a designated National Wild River and falls under federal subsistence management authority. Until recently, federal and state management have not been in conflict for fisheries in the Unalakleet River drainage. However, in March 2009, the FSB closed the federal public waters of the Unalakleet River (upstream from the mouth of the Chiroskey River, or approximately 23 river miles from the village) to the taking of king salmon from July 1–31. It is unclear how this closure will affect sport anglers intending to catch king salmon; however, the vast majority of the sport fishing effort occurs below the Chiroskey River and so will likely not be affected.

Recent Board of Fisheries Actions

In 2004, the BOF designated king salmon stocks in the Unalakleet River a stock of yield concern and consequently instituted an annual sport bag limit of 4 fish per year, 20 in or larger in length, of which only 2 could come from the North River, and the bag limit was changed from 1 to 2 fish (only one 20 in or longer). Previously, there was no annual limit and the bag limit was 1 king salmon 20 in or longer and 10 king salmon less than 20 inches in length. This action was taken in response to the escapements having failed to meet the lower end of the escapement goal for the previous 3 years. In addition, the "other salmon" limit was set at 10 fish of which only 4 could be chum, coho, or sockeye salmon in combination. This allowed additional harvest opportunity for pink salmon but limited chum, coho, and sockeye salmon harvest. Previously, the bag limit for "other salmon" had been 5 fish.

In 2007, the BOF adopted the *Unalakleet River King Salmon Management Plan*, which used thresholds within the escapement goal range and projected North River tower counts to trigger inseason management actions in the subsistence, sport, and commercial fisheries. With the adoption of this plan, the annual limit was reduced from 4 to 2 king salmon 20 inches or longer. No proposals for the Unalakleet River salmon sport fisheries were adopted by the BOF at either the 2010 or 2013 meetings.

Current or Recommended Research and Management Activities

Salmon escapements in the Unalakleet River are monitored using a counting tower in the North River, a floating weir in the mainstem Unalakleet River above the confluence with the North River, and aerial surveys. The tower is a cooperative project funded through the Norton Sound Economic Development Corporation (NSEDC) and operated by NSEDC with guidance by ADF&G Division of Commercial Fisheries, and it provides a reliable estimate of escapement into the North River because of water clarity. Aerial surveys are difficult in the Unalakleet River because of its dark bottom and tannin-stained water. These surveys provide a measure of the minimum escapement but are unreliable as an indicator of total escapement in this river. From 1985 through 2012, the Division of Commercial Fisheries operated a variable-mesh test net in the Lower Unalakleet River to get information on run timing, as well as age, size, and sex composition of salmon species. This project was discontinued after concerns by residents of Unalakleet that the number of fish killed each year outweighed the benefits of collecting this information.

In 2010, a floating weir was installed in the mainstem Unalakleet River approximately 14 river miles upstream of the village, to enumerate and sample king salmon, and was scheduled to be in operation only from mid-June through July each year. The weir was installed successfully; however, there were problems capturing king salmon at the weir for biological sampling, and the crew had to beach seine upriver to collect age, sex, and length (ASL) data. Improvements to trap design were made for the 2011 season, and king salmon were easier to capture. In addition, because king salmon were still moving upriver when the weir was removed at the end of July, the 2011 and 2012 seasons were extended into mid-August to ensure that all king salmon were counted. In 2013, the weir was in operation through August 19, and in 2014 it will operate into September in an attempt to enumerate the coho run. This is a federally funded project through the Office of Subsistence Management, with cooperation from BLM, NSEDC, and ADF&G's divisions of Sport and Commercial Fisheries.

A 3-year coho salmon radiotelemetry project, supported in part by BLM, began in 2004. Approximately 200 coho salmon were implanted with radio transmitters each year and tracked to spawning locations. Results of this project suggest that 8–15% of coho salmon entering the Unalakleet River migrate up the North River to spawn (Joy and Reed 2007). A similar research project was conducted on king salmon in the Unalakleet River during 1997 and 1998. In 1997, 37% of radiotagged king salmon spawned in the North River, increasing to 40% in 1998 (Wuttig 1998 and 1999). These data are used to expand the North River tower estimate to allow a relative estimate of the escapement in the entire drainage. In 2009 and 2010, the radiotelemetry experiment on king salmon was repeated, and preliminary results show that 34% of the escapement went into the North River in 2009 and 53% in 2010. These results are significantly higher than the previous 1997 and 1998 findings, which could be biased low based on late run timing of king salmon up the North River in these years (Joy and Reed *In prep*).

In 2011, the Division of Sport Fish initiated a research project to investigate juvenile king and coho salmon ecology in the Unalakleet River. This project is designed to estimate productivity (number of smolt produced per spawner), condition, and growth rates, as well as to determine whether a relationships exists between salmon productivity and effects of marine-derived nutrients (MDN) on smolt production. Preliminary results suggest that pink and chum salmon fry constituted 10-20% of king and coho salmon diets, king salmon begin their outmigration to sea in the spring under the river ice, and coho salmon primarily utilize off-channel waters for

feeding while king salmon are more often found in the mainstem Unalakleet and North Rivers (P. Joy, Biologist, ADF&G, Fairbanks, personal communication). Additional funding is being sought to continue this project through 2015.

Division of Sport Fish staff have frequently assisted and cooperated informally with the Division of Commercial Fisheries and the Native Village of Unalakleet (NVU) on projects, including the partial funding of counting towers (from which spawning escapements are estimated), surveys for abundance, and observation of spawning concentrations.

NOME AREA ROADSIDE SALMON FISHERIES

Background and Historical Perspective

Nine rivers, accessible from the road system near Nome, sustain some level of sport fishing effort for salmon (Figure 4). The Nome River has accounted for about 12% of all the sport fishing effort in the entire NW/NSMA during 2007 to 2011 (Table 4). Effort on the Nome River dropped steadily from a high of 7,194 angler-days in 1990 to about 651 angler-days in 2003 (Table 4). Trends in effort have generally coincided with the abundance of pink salmon available to anglers; however, recent fluctuations in summer employment in the Nome area associated with mining have possibly contributed to the recent effort variation as well. The recent 5-year average (2007–2011) on the Nome River was 3,004 angler-days (Table 4). An average of 1,768 salmon was harvested annually from the Nome River during this period, of which 60% were pink salmon (Tables 7-10). The alternate-year strong pink salmon run in Norton Sound has a major influence on salmon harvests in sport fisheries on road-accessible streams. This relationship has been strongest in the Nome River because of its proximity to Nome and the ease of access to visitors and residents alike. The pink salmon harvest of about 2,954 fish in 2008 was the second highest since 1996, and the number of angler-days (5,272) in 2008 was the highest angler effort since 1992. The increased effort and harvest was probably influenced by a strong run of 1.1 million fish and reduced subsistence opportunity on depressed chum salmon stocks, which may have focused local subsistence fishing effort on the abundant pink salmon, in part to meet the local need for salmon. Coho salmon catch and harvest has been down slightly, with the recent 5-year average being below the recent 10-year average (Table 8).

Chum salmon escapements had been increasing in the Nome River in recent years since the collapse in 1990 and had reached up to 7,034 fish in 2007, but in 2009 these numbers had dropped again to 1,565 fish. In 2012, the chum salmon escapement into the Nome River was 1,987 fish (Table 2). The pink salmon escapement dropped from over 1.1 million fish in 2008 to just 16,490 fish in 2009; however, due to the alternating strong (even-year) and weak (odd-year) run life-cycle of pink salmon, this drop was not unexpected. The parent year escapement for the 2009 return was 24,395 fish in 2007. The pink salmon escapement in 2012 was 149,119 fish, a reduction of 13% from parent year 2010 (Table 2).

The Niukluk and Fish rivers are also popular sport fishing locations for salmon (Figure 4). Two guiding operations are located on the Niukluk River, and another uses helicopters to transport clients to the upper reaches of these rivers to fish primarily for Arctic grayling, but also coho salmon and Dolly Varden. Many residents of Nome have summer cabins on the Niukluk River or fish camps along the river. Residents of White Mountain also travel upriver to the Niukluk for recreation and because the river has several good spots to beach seine for salmon. Since the construction of the bridge over Safety Sound in 1980, as well as improvements to the road, access to the Niukluk and Fish rivers has improved and this area has become a desirable

destination for the road-bound angler. For the years 2007–2011, the drainage sustained an average annual effort of 3,144 angler-days (Table 4), and an average of 1,381 salmon have been harvested annually from the Fish and Niukluk rivers, most of which (79%) are coho salmon (Tables 7–10). Since 2005, the lower bound of the escapement goal range for coho salmon (2,400–6,100) has been met every year through 2011, averaging over 7,000 coho salmon a year during this time (Table 2). The 2012 count of 1,729 is considered incomplete, because the counting tower was inoperable after August 16 due to high water, well before the historical coho salmon escapement midpoint date of August 21. Historically, king salmon have not been found in large numbers in the Niukluk River, and escapement of king salmon into the Niukluk River has been less than 200 fish.

The Pilgrim River, with its headwaters at Salmon Lake, has historically been somewhat less popular for salmon fishing. The Pilgrim River sustained an average annual effort of 327 angler-days for the years 2007–2011 (Table 4), and about 46 salmon were harvested annually during that period, all of which were coho (Tables 7–10). Some of this effort was directed toward other species, because the Pilgrim (and the nearby Kuzitrin River) provides anglers with access to the best northern pike fishing on the Nome road system. There is a Bureau of Land Management (BLM) campground at the outlet of Salmon Lake, and from there, the river can be floated for about 25 river miles to the bridge at mile 65 of the Kougarok Road. Riverboats can be launched at the bridge for access to downstream locations. The Pilgrim River is also open to subsistence fishing with gill nets, beach seines, and dip nets, so it is likely that local residents who desire sockeye salmon from the Pilgrim River would use this gear under a subsistence fishing permit rather than by sport fishing with hook-and-line. This may explain, in part, the lower sport fishing effort and salmon harvest on the Pilgrim River, when compared to those systems with larger runs of coho and pink salmon, species that are more easily caught by sport fishing gear (such as Nome and Niukluk rivers). Until 2013, the Fish/Niukluk and the Pilgrim rivers were the only road-accessible rivers where sport fishing for chum salmon was allowed; however, the combined annual harvests over the last 5 years studied (2007–2011) from these drainages have only been 55 chum salmon, all of which came from the Fish River drainage (Table 10).

Large sockeye escapements during 2003–2008 drew additional subsistence effort to this drainage (Table 2). All 5 species of Pacific salmon occur in the Pilgrim River. Sockeye salmon spawn in Salmon Lake, and runs initially appeared to respond positively to lake fertilization conducted by Norton Sound Economic Development Corporation (NSEDC), as well as favorable marine conditions (C. Lean, Biologist, NSEDC, Nome, personal communication). However, recent escapements have decreased, and the efficacy of fertilization to enhance smolt condition or adult returns remains unclear (Hamazaki et al. 2012). Escapement of sockeye salmon past the weir in the Pilgrim River for the years 2004–2008 ranged from 20,448–85,520 fish, dropped to 953 fish in 2009, and was back up to 7,085 fish in 2012 (Table 2). These compare to an average escapement of 5,400 for 3 years of enumeration between 2000 and 2002 (Table 2).

The mouth of the Snake River is in downtown Nome. This small stream can be accessed from a bridge at about mile 8 of the Teller Road and from the nearby Glacier Creek Road. Over the recent 5-year period (2007–2011), the Snake River has sustained an average annual effort of 1,123 angler-days, with an annual harvest of 514 salmon, of which 56% were coho salmon and 42% pink salmon (Tables 4, 7–10). Other popular road-accessible waters include the Solomon and Sinuk rivers. Annual harvests in these rivers, combined, for the recent 5-year period (2007–2011), have averaged about 235 coho salmon and 146 pink salmon (Tables 8-9). During years of

high pink salmon abundance (even years), this species has dominated catches and harvests in most Nome roadside streams (Table 9).

Recent Fishery Performance

While pink salmon are by far the most prevalent salmon found in Norton Sound roadside streams, with over 1 million fish returning to some streams in even years, estimated sport harvest of pink salmon averaged only about 1,578 fish for the years 2007–2011 and comprised just 34% of the total salmon harvest. Although they are less abundant, coho salmon are a more popular sport fish, probably due to their size, aggressiveness, and superior flavor. Estimated sport harvest of coho salmon in roadside fisheries around Nome for the years 2007–2011 averaged 2,988 fish per year and comprised 65% of the total salmon harvest. Prior to 2013, chum salmon fishing had been closed for many years because of depressed stocks, and both runs and harvests of sockeye and king salmon in the Nome area are negligible. Although sockeye salmon have recently returned in large numbers to the Pilgrim River, they are typically targeted with gillnets and seines under subsistence regulations.

Sport fishing effort in the Fish/Niukluk river system has ranged from a high of about 4,800 angler-days in 1999 to 1,049 angler-days in 2006 and averaged 3,144 angler-days for the years 2007–2011 (Table 4). Estimated harvest of salmon was 1,873 fish in 2012, of which 62% were coho salmon (1,163 fish; Tables 7-10). Although sport fishing for chum salmon is allowed in this drainage, harvest has remained low (Table 10), and most of the chum salmon harvested by hook-and-line are by subsistence fishers. A low harvest of only a few hundred pink salmon occurred in the even years since 1998 in spite of an abundant run of this species, with over 1 million fish in the Niukluk River in some years. This low harvest of pink salmon is probably due to the poor condition of the fish by the time they reach the Niukluk River, although 969 pink salmon were harvested in 2008, a year when the escapement on the Niukluk River was almost 670,000 fish (Tables 2 and 9). In 2012, the pink salmon harvest was 636 fish, and escapement was just over 249,000 fish.

The Pilgrim River is the other road-accessible water where chum salmon sport fishing is still allowed, but there has been no harvest reported since 1995. Effort there in 2012 was estimated at 76 angler-days, well below the recent 5-year (2007–2011) average of 327 angler-days (Table 4). Large returns of sockeye salmon from 2004 to 2008 probably reduced sport effort on other species and other systems, although in 2012 escapement was just 7,085 fish (Table 2). The high quality of the sockeye salmon coupled with ease of access and ability to use subsistence gear (gillnets and seines) in the river provides local residents with an abundant, easily harvested source of fish without having to use sport fishing gear for less desirable species.

Fishery Objectives and Management

There have been no specific management objectives identified for salmon sport fisheries for the Nome roadside streams. The goal of sport fishery management in these waters is to maintain opportunity for anglers to participate in the fisheries and to assure that escapement goals are met. Sport fishery harvests are small, and emergency actions to restrict sport harvest are generally not contemplated unless escapement-monitoring projects indicate that a particular run is small and that restrictions in subsistence fisheries may be necessary in order to meet escapement goals. SEGs, based on aerial surveys, are in place. SEG goals based on tower estimates (Snake and Pilgrim rivers) and weir counts (Nome and Pilgrim rivers) will not be established until additional years of reliable data have been accumulated.

Current Issues

Until recently, Seward Peninsula chum salmon stocks had been in a steady decline since the early 1980s (Menard et al. 2013). This led to increasingly restrictive sport and commercial management and the implementation of a Tier II subsistence fishery (limited to fishers who have a customary and direct dependence on a resource) from 1999–2005 in the Nome Subdistrict. Chum salmon runs have improved in recent years to allow the subsistence fishery to be managed as a Tier I fishery since 2006. All rivers in northern Norton Sound, from the Sinuk River in the west to Topkok Head in the east, were closed to sport fishing for chum salmon by regulation in 1992. Chum salmon runs have stabilized and even increased in some drainages in recent years, suggesting that runs may be in the process of recovering; and restrictions on commercial and sport fisheries are no longer necessary. Subsdistrictwide escapement averaged over 60,000 chum salmon for the years 2004–2013, well above the BEG range of 23,000–35,000 fish. However, the decision by the BOF to reopen the chum salmon sport fishery to a bag and possession limit of 3 fish per day in 2013 was not embraced by many Nome-area residents and will likely remain a source of conflict between ADF&G and local subsistence fishers. Although it is anticipated that sport harvests will be inconsequential in relation to the size of the escapements, ADF&G managers will nonetheless monitor tower and weir counts in the Nome Subdistrict carefully and implement restrictions if escapement goals for chum salmon are not projected to be met.

In 2012, a disagreement between Division of Commercial Fisheries managers and Council Native Corporation over coho salmon management led to the cancellation of the land lease on which the Niukluk River counting tower was stationed, and consequently the tower and camp were removed. It is unlikely that the counting tower on the Niukluk River will be operating in the near future, and materials and resources from this project were transferred to the Solomon River, which previously did not have a salmon enumeration project aside from periodic aerial surveys.

Recent Board of Fisheries Actions

In 2013, the BOF adopted a proposal to reopen the sport fishery for chum salmon to a bag and possession limit of 3 fish per day in all Nome Subdistrict waters except for the Penny and Cripple rivers, which remain closed due to their very small size and subsequent small runs of chum salmon.

Current and Recommended Research and Management Activities

Current research and management activities on Nome roadside salmon populations are primarily conducted by the Division of Commercial Fisheries in conjunction with NSEDC's fisheries office. These groups cooperatively operate escapement enumeration projects on the Nome, Solomon, Eldorado, Pilgrim, and Snake rivers. All projects use weirs except the Solomon River, where a counting tower is operated by the Division of Commercial Fisheries throughout the salmon runs. The weirs direct the movement of all fish, which are counted as they are permitted to pass through an opening in the weir several times each day. Since 2001, a weir has been in operation through BLM, NSEDC, or the Division of Commercial Fisheries at the outlet of Glacial Lake on the Sinuk River to enumerate sockeye salmon migrating into the lake. In 2012, a video enumeration pilot study was begun on the Lower Sinuk River to count all species of salmon, but the study had mixed results. Recently, NSEDC in cooperation with LGL-Alaska has conducted experiments on the Fish, Niukluk, and Nome river drainages attempting to estimate coho salmon escapements using abundance of smolt, as well as measuring available freshwater

fry habitat. To date, the results have shown that the relationship between smolt abundance and subsequent adult returns has been difficult to measure.

NORTHWESTERN ALASKA DOLLY VARDEN AND ARCTIC CHAR

Background and Historical Perspective

In northwestern Alaska, Arctic char occur in lakes in the Kigluaik Mountains and in some headwater lakes in the Kobuk and Noatak river drainages, while Dolly Varden are common inhabitants of most coastal streams and large rivers (Figures 2–6). Although ADF&G typically combines Dolly Varden and Arctic char for bag limits and data collection for harvest surveys, they are 2 different species with distinctly different life histories. Arctic char are present only as lake-resident populations, while Dolly Varden may be present as lake-resident, stream-resident, or anadromous populations. Arctic char distribution is very limited in northwestern Alaska, and the vast majority of "char" fisheries are actually directed toward Dolly Varden.

Many residents of northwestern Alaska maintain a traditional subsistence lifestyle in which Dolly Varden comprise an important part of their traditional harvest and, in some communities, outrank salmon and whitefish in importance to the subsistence economy. The number of Dolly Varden harvested for subsistence purposes are largely undocumented in northwestern Alaska but vastly exceed the number taken by sport anglers. Intermittent community subsistence harvest estimates dating back to 1959 for the villages of Kivalina and Noatak (Scanlon 2008) and personal observation by the area biologist and subsistence resource specialist suggest that 15,000 to 30,000 Dolly Varden are harvested annually in this area (James Magdanz, Area Biologist, ADF&G, Kotzebue, personal communication). In 2007, the residents of Kivalina harvested 67,739 pounds of Dolly Varden, second only to bearded seal in terms of pounds of harvested subsistence foods; and in Noatak, 33,771 pounds of Dolly Varden were harvested, second only to caribou (Magdanz et al. 2010). Fish are captured with gillnets or beach seines during open water periods and with hook-and-line during winter. Dolly Varden are also an important subsistence resource in Norton Sound; however, their relative importance is minor compared to salmon.

Observations and aerial surveys suggest that Dolly Varden spawner abundance is low in most rivers; however, spawning occurs in almost all drainages of Norton Sound, some northern Seward Peninsula rivers, and the major drainages of Kotzebue Sound and the Chukchi Sea. Aerial surveys of spawning Dolly Varden conducted during the mid-1990s indicated that about 9,000–12,000 spawned annually in the Noatak drainage (Table 13). Total abundance of spawning Dolly Varden in northwestern Alaska is unknown. Partial surveys for the years 2002–2005 and angler reports suggested that spawner abundance in Noatak, Wulik, and Kivalina river streams had declined to some degree; however, it appears based upon anecdotal subsistence fishing reports that fishing has been good and subsistence needs for Dolly Varden are being met in northwestern Alaska.

Anadromous Dolly Varden make their first seaward migration at age-3 or age-4 in the spring to feed during the summer then return to freshwater each winter. Upon reaching sexual maturity at ages 6-9, they return to their home river to spawn. Each fall, nonspawning Dolly Varden return to freshwater to overwinter in mixed-stock aggregations. Some Dolly Varden stocks spawn in August, while others spawn in September or October. During summer, spawning Dolly Varden are caught in some northwestern Alaskan streams; however, most sport fisheries for Dolly Varden target overwintering populations either in the fall as they enter freshwater from the sea or in the spring as they move toward the sea. Because overwintering populations are composed of

mixed stocks, potentially from a wide geographic area, harvests in the few rivers with good angler access have been sustainable. Harvests can be substantial in streams along the Nome road system, and if directed toward a single stock, they might not be sustainable.

Movements of Norton Sound Dolly Varden coincide with those of salmon and are sometimes present in streams during summer to feed on salmon eggs, especially during years of high pink salmon abundance. They are also likely to remain in streams during the spring following a large pink salmon run in order to feed on abundant outmigrating salmon fry. The timing of the fall movement of Dolly Varden into Seward Peninsula streams has varied widely over the past 10 years, resulting in annual changes in the availability of Dolly Varden to the fall fishery. Fisheries and harvests in this area follow these patterns of availability. In 1988, the BOF adopted the bag limit of 10 Dolly Varden and Arctic char per day with 10 in possession, with exceptions for the Noatak, Wulik, and Kivalina rivers where only 2 of the 10 fish could be over 20 inches in length. In 1994, the BOF adopted the current bag and possession limits for Dolly Varden and Arctic char in the AYK region with 10 fish per day, only 2 fish 20 inches or longer allowed in marine or flowing waters and 2 fish per day (no size limit) allowed in lakes. Due to habitat preferences, these regulations allow a liberal limit for Dolly Varden while protecting spawning fish and a conservative limit for Arctic char (found primarily in lakes) without the need for anglers to differentiate between these 2 closely related species.

Drainages of Kotzebue Sound and the Chukchi Sea are known for the large size of anadromous Dolly Varden available to the sport angler. Since the inception of ADF&G's Trophy Fish Program in 1967, 135 out of 315 qualifying fish (43%) in the Dolly Varden/Arctic char category have come from the NW/NSMA. In addition, the current Alaska sport fish angling record for Arctic char/Dolly Varden (27 lb 4 oz) was a Dolly Varden taken from the Wulik River in 2002, surpassing the previous record of 20 lb 12 oz taken from the same river in 2000.

Abundance and size composition were estimated for Dolly Varden overwintering in the Nome River in 1991 and 1992 and the Solomon River in 1991. In addition, the movement of marked fish from the Nome River in 1991 to other rivers in 1992 was estimated (DeCicco 1992a and 1993a). These data, in combination with harvest estimates and observed changes in abundance, have been used to guide ADF&G management activities. The results indicate Dolly Varden that overwinter in a particular stream may overwinter in other streams during subsequent years. Hence, a restrictive bag limit in 1 stream does not necessarily protect a single stock because fish range widely and stocks mix over a broad geographic area. During the winter of 2000–2001, Dolly Varden were radiotagged in the Nome and Solomon rivers to document the critical wintering areas in these rivers (DeCicco 2001).

Studies in the Kotzebue Sound subarea have occurred intermittently since 1967, but in recent years they have been limited to aerial index counts of spawning Dolly Varden in Noatak River tributary streams with the assistance of the NPS, and index counts of Dolly Varden overwintering in the Wulik River with the assistance of the ADF&G-Division of Habitat and the Red Dog Mine. Data on the abundance of Dolly Varden overwintering in the Wulik River will continue to be collected, in cooperation with these agencies. A genetics study was funded through the USFWS (US Fish and Wildlife Service) Office of Subsistence Management (OSM) to determine the relationships among stocks north and south of the Bering Strait. Results suggested that stocks in western Alaska are structured along geographic lines with good separation among stocks (Crane et al. 2005). A detailed study of a single spawning stock in the Noatak drainage was begun in 2001. This spawning stock assessment project was completed,

but high water conditions during critical times of fish movement in both 2001 and 2002 resulted in incomplete data (Scanlon 2004). In October 2003, 15 Dolly Varden were radiotagged in the Wulik River to determine movement over the course of the winter. These fish remained in the same vicinity as tagged until June 2005 (A. DeCicco, 2006, unpublished data). At that time, 2 fish, likely spawners, remained in the Wulik River, and 1 had been captured at Kivalina. The remaining radiotagged fish could not be located and it is believed that these fish had already migrated to salt water.

Recent Fishery Performance

Over the recent 5-year period (2007–2011), sport harvests of Dolly Varden and Arctic char have averaged 3,075 fish annually in the Seward Peninsula/Norton Sound subarea and 1,453 fish in the Kotzebue Sound/Chukchi Sea subarea (Table 11). The higher harvests in the Seward Peninsula/Norton Sound area are most likely because local residents have good road access to fishing areas where fish taken by hook-and-line are used for food. In the Kotzebue Sound subarea, fishing sites are accessed by aircraft or raft, and much of the effort is from outside the local area by anglers seeking a high-quality fishing experience. Estimated sport fishing effort levels in both the Seward Peninsula/Norton Sound subarea and the Kotzebue Sound subarea have been fairly consistent over the past several years. Average annual catch for 2007–2011 was 16,062 Dolly Varden in the NW/NSMA (Table 12). During the recent 5-year period (2007–2011), about 72% of all Dolly Varden caught in the NW/NSMA were released.

Dolly Varden harvests have been reported in most of the rivers in the Seward Peninsula/Norton Sound subarea, with the highest harvests coming from the Nome, Unalakleet, and Fish/Niukluk rivers (Table 11). In the Kotzebue/Chukchi Sea subarea, the highest harvests are from the Noatak and Wulik rivers and the "other rivers" category, which includes the Kivalina River.

The Wulik River is located about 90 miles north of Kotzebue and is well known as an excellent fishing destination for large Dolly Varden (Figure 5). The river is about 90 miles long and enters the Chukchi Sea through Kivalina Lagoon near the village of Kivalina. Dolly Varden from the Wulik River are heavily used for subsistence by the residents of Kivalina (Magdanz et al. 2011). Sport fishing occurs throughout the open water period, but the majority of effort and harvest occurs during late August and September when Dolly Varden return from the sea to winter in the river.

Fishery Objectives and Management

Management of Dolly Varden in Norton Sound streams is structured to maintain opportunity and allow a relatively liberal bag limit from mixed stock population aggregations. In the Kotzebue subarea, the intent is to maintain a high-quality fishery with the opportunity to harvest a small number of large-sized Dolly Varden (20 inches or larger) under a bag limit that protects the spawning component of the population (generally over 20 inches in length), minimizes conflicts with subsistence users, and does not adversely affect the population structure. Because of the differential size structure of the population groups north and south of the Bering Strait (with Dolly Varden found north of the Bering Strait generally reaching much larger sizes and not becoming sexually mature until they reach approximately 20 inches, unlike the those found in streams below the Bering Strait), these objectives can be addressed with the same general bag and possession limit regulation of 10 fish per day with only two 20 inches or larger in length.

Current Issues and Fishery Outlook

The Wulik River is probably the most important Dolly Varden stream in northwestern Alaska, with over 100,000 anadromous Dolly Varden overwintering during some years (Table 13). The Red Dog zinc mine located in the headwaters of this drainage poses a potential threat to these fish and the water quality of the river. Water quality near the mine is systematically monitored to ensure that it is operated in an environmentally sensitive manner. The Red Dog Mine funds a program run by ADF&G's Division of Habitat to monitor heavy-metal concentrations in receiving waters and fish tissues. Fish tissues are sampled for heavy metals in the spring and fall each year on a continuing basis in cooperation with DNR. The recent discovery of additional ore bodies is likely to add new challenges from mineral development in this important drainage.

Dolly Varden in Norton Sound are wide-ranging; they spawn in most rivers and overwinter in all major drainages. In the Kotzebue Sound subarea, the sport fishery is likely to grow slowly in popularity as more anglers experience these high-quality fishing opportunities. Until these fisheries grow to the point that harvests are thought to affect spawner abundance, spawner success, or population structure, it is unlikely that additional management action will be necessary. Recent aerial survey counts suggest that the population of overwintering fish in the Wulik River is stable, and counts have regularly exceeded 100,000 fish but have dropped off in recent years. Spawning and overwintering populations will continue to be monitored in the future when possible.

Recent Board of Fisheries Actions

No proposals for the Northwest Dolly Varden and Arctic char fisheries were adopted by the BOF at either the 2010 or 2013 meetings.

Current and Recommended Research and Management Activities

In 2012 and 2013, ADF&G, in cooperation with the University of Alaska Fairbanks and Red Dog Mine, deployed pop-up satellite archival (P-SAT) tags in Dolly Varden in the Wulik River in June to examine marine movements and temperature and depth preferences of outmigrating fish during the summer months. Results showed that most tagged fish stayed in the Kotzebue Sound area, including several that went immediately to the Noatak River to spawn, but that several fish each year travelled 124–249 miles (200-400 km) from the Wulik River to suspected feeding areas in the Chukchi Sea near Russia (Seitz 2013). In addition, these tags provided information on preferred temperature and depth occupancy, showing that once the fish reached the feeding areas in the Chukchi Sea, they made dives of 33–164 ft (10-50 m) almost continuously throughout the day. Currently, funding is being sought from Teck, the parent company of Red Dog Mine, to continue this project for up to 5 years.

In 2012, ADF&G in cooperation with NPS began a research project on Dolly Varden in the Noatak River using radiotelemetry to look for overwintering locations of nonspawning fish that enter the Noatak River in September just prior to freeze-up. Unlike the Wulik River, the Noatak River is very wide and deep in many places, making aerial surveys of overwintering fish difficult. Consequently, there is no reliable information on the number of non-spawning, overwintering fish using the Noatak each year. Based on the information regarding major overwintering locations, 2 DIDSON® side-scanning sonar units (1 on each bank) were planned to be used to enumerate the outmigration of Dolly Varden after ice-out. However, preliminary results show that Dolly Varden that overwinter in the Noatak River do so in areas too wide to

successfully count them with sonar (Schwanke 2012), and the objectives of this project have been modified so that overwintering locations and outmigration are the main focus. Radio-tracking via fixed-wing aircraft and tracking stations deployed along the riverbank will continue through September 2014.

NORTHWESTERN ALASKA ARCTIC GRAYLING

Background and Historical Perspective

Sport fisheries for Arctic grayling in the NW/NSMA are relatively small when compared to the remainder of the AYK Region, with average annual harvests of 816 fish in the Seward Peninsula/Norton Sound subarea and 484 fish in the Kotzebue/Chukchi Sea subarea for the years 2007–2011 (Tables 14 and 15). Even though the harvests are relatively small, Arctic grayling are the most numerous species harvested in the Kotzebue/Chukchi Sea subarea and normally the third or fourth most commonly harvested species in the Seward Peninsula/Norton Sound subarea.

The Seward Peninsula has long been known for its production of large Arctic grayling, with approximately 25% of all trophy Arctic grayling registered with ADF&G's Trophy Fish Program. However, many populations are quite small, and because they often inhabit small streams, they must be managed as independent stocks with regulations tailored to the individual populations (or groups of similarly structured populations) to prevent overexploitation.

Since 1989, the stock status of Arctic grayling populations in several rivers where sport fishing occurs on the Seward Peninsula has been monitored (DeCicco 1990, 1991, 1992b, 1993b, 1994–1999, 2002, 2004, 2007; DeCicco and Gryska 2007; DeCicco and Wallendorf 2000; Gryska 2004, 2006, *In prep* a-b; Gryska and Taras 2007; Joy 2006; Viavant *In prep*). The Nome River stock was found to be overexploited, while the current levels of harvest on the Niukluk, Fish, Pilgrim, Snake, and Sinuk rivers populations are believed to be sustainable. The Solomon River was found to have a very low Arctic grayling population and was closed to fishing for Arctic grayling in 1992.

Arctic grayling densities in most Seward Peninsula rivers are low. They generally range from about 40 to 60 fish per mile in the Nome and Sinuk rivers, to about 200 fish per mile in the Pilgrim River. Densities in the Niukluk and Fish rivers are higher at about 470 and about 500 fish per mile, respectively (DeCicco 2002; Viavant *In prep*). In contrast, Interior Alaska Arctic grayling populations often exceed 500 fish per mile (Ridder et al. 1993; Ridder 2000). Arctic grayling from rivers on the Seward Peninsula are large in general and are generally older and larger when they first spawn than Arctic grayling in Interior Alaska streams. Arctic grayling from the Snake River were found to be 50% mature at 307 mm fork length (FL) and 99% mature at 404 mm FL (DeCicco and Gryska 2007). Arctic grayling from northwestern Alaska can live for more than 20 years, and 1 fish from the Eldorado River was determined to be approximately 29 years old using otolith analysis. Some Arctic grayling may survive to grow very large, particularly in rivers where fishing effort is light. For example, in the lightly exploited Sinuk River, almost 70% of the 1991 sample was age-8 or older, and the average total length of all fish sampled was over 457 mm (Joy 2006).

Arctic grayling occur in almost all streams and in many of the lakes in the Kotzebue area, but most are inaccessible by road and therefore lightly exploited. Most Arctic grayling in this area are caught in association with wilderness float trips or as an alternate species in trips directed

toward fishing for Dolly Varden or sheefish. For the years 2007–2011, the estimated harvest rates were only about 10% of the total catch (Table 15).

Prior to 1988, the bag limit for Arctic grayling in the NW/NSMA was 15 fish, only 2 of which could be 20 inches or larger. In 1988, the BOF established a separate bag and possession limit for Arctic grayling in Northern Norton Sound of 5 per day, with only one 15 inches or larger. The effect of this change is reflected in harvest estimates that averaged about 4,300 Arctic grayling annually for the years 1980–1988 but dropped to about 1,550 from 1990 to 2000. This regulatory change probably resulted in the near doubling of the Arctic grayling populations in the Fish and Niukluk rivers when compared to estimates from the early 1990s (Gryska and Taras 2007; Viavant *In prep*; Gryska *In prep* b).

Recent Fishery Performance

Seward Peninsula/Norton Sound Subarea

Estimated harvests of Arctic grayling by sport anglers in the Seward Peninsula/Norton Sound subarea have declined since 1991 when harvest peaked at 5,121 fish. For the years 2007–2011, harvests averaged 816 fish per year (Table 14).

The estimated catch of Arctic grayling fluctuates greatly from year to year, ranging from approximately 4,000 to 15,000 fish during the past 10 years. Catch-and-release appears to be a prevalent practice in the Seward Peninsula/Norton Sound subarea, with average catch retention for Arctic grayling of only 9% from 2007–2011.

Current exploitation rates on most Northwestern Alaska Arctic grayling populations are unknown, but because most are in remote areas and harvests are low, exploitation is believed to be light. Some estimates of exploitation in Nome-area roadside streams are available by combining harvest data with abundance data. Based on this information, exploitation rates of Arctic grayling were estimated to range from 10% to 20% in some streams during the early 1990s. More recent estimates for the Niukluk and Fish rivers suggest that annual exploitation in these streams has been less than 5% over the past 10 years. In addition, guided anglers have caught more than 15,000 grayling in the Seward Peninsula/Norton Sound subarea for the years 2006–2012 but harvested just 65 fish (Sigurdsson and Powers 2009–2013). These data suggest a change in angler motivation away from harvest as a primary reason for fishing.

Kotzebue Subarea

In the Kotzebue/Chukchi Sea subarea, Arctic grayling harvests for the years 2007–2011 have ranged between 293 and 836 fish (Table 15). Catches over the same period have ranged quite widely from 2,385 in 2010 to 7,169 in 2009. In 2012, the harvest and catch were 626 and 2,659 fish, respectively. The percentage of catch that was harvested has averaged about 10% annually over the recent 5-year period (Table 15). Most Arctic grayling from this subarea are harvested in association with float trips or while fishing for other species. It is likely that harvests will remain relatively stable until participation in this subarea increases significantly.

Fishery Objectives and Management

Research on status of resident Arctic grayling populations in the rivers accessible from the road system in northern Norton Sound has been ongoing for approximately 20 years. Arctic grayling in Northwestern Alaska may live for more than 20 years and attain a large size. Data collection on population abundance, age, and size composition by river throughout this period has allowed

the development of regulations tailored to individual rivers or groups of rivers that share population characteristics. Overall management objectives for these Arctic grayling populations are to maintain a given abundance of fish ≥15 inches in length in populations, and to allow for population recovery in systems that have been stressed by overexploitation. The areawide bag and possession limits are 5 fish per day, with only 1 fish 15 inches or longer. This bag limit is appropriate for drainages with Arctic grayling populations that have characteristics of lightly exploited populations. These characteristics include large average size and a high proportion of sexually mature fish that are 7 years of age or older in the population. Abundance is directly related to the river's size and flow characteristics; therefore, both abundance and population density may vary by river. Rivers that share these characteristics and regulations include the Fish/Niukluk River system and the Eldorado and Sinuk rivers. On the other extreme are overexploited populations where abundance is very low. Rivers like the Nome and Solomon are in this category. These rivers are closed to all fishing for Arctic grayling.

Populations intermediate between these 2 categories include those in the Pilgrim and Snake rivers. These populations contain a smaller proportion of sexually mature fish. They have been affected somewhat by harvest, but Arctic grayling are still relatively abundant and populations appear stable. In these rivers, the regulations allow harvest of 2 Arctic grayling per day, with only 1 over 15 inches. Populations are assessed periodically to estimate whether they are maintaining desired characteristics. Recent stock assessments of Arctic grayling populations in road-accessible waters suggest that the current management approach is working and that population size and size compositions are being sustained.

Management objectives have not been developed for remote Arctic grayling waters of the remainder of the Seward Peninsula or the Kotzebue subarea. Anglers rarely visit these waters, and populations are presumed to be unexploited. General regulations for these waters provide for a bag and possession limit of 5 fish, with no size limit. Until effort and harvests increase dramatically, it is likely that regulations will remain unchanged.

In 2004, the *Wild Arctic Grayling Management Plan* was adopted. The plan created 3 management approaches with associated regulatory options: regional, conservative, and special management. The regulations adopted under the regional management approach (5-fish bag and possession limit, season open year-round) did change the general Arctic grayling regulations in the NW/NSMA from 10 to 5 fish, with the exceptions of the Dalton Highway Corridor, Northern Norton Sound, and the Unalakleet River drainage, which already had bag limits of 5 fish, and those fisheries classified under the conservative and special management approach. The Snake and Pilgrim rivers are classified under the conservative management approach, and the Nome and Solomon rivers are classified under special management.

Current Issues and Fishery Outlook

There is concern on the part of the public and ADF&G staff that populations of Arctic grayling in the vicinity of Nome that are road accessible, especially the Nome and Solomon rivers, have been overexploited and may not recover for many years. The abundance of fish ≥15 inches has declined since 1999 (DeCicco 2007). The Nome River population has shown little change in abundance over the past several years. An experimental restoration project in 1998 to increase survival of young-of-the-year Arctic grayling by rearing them in a gravel pit failed (DeCicco 2004). Additional restoration efforts were conducted more recently using a different rearing pond, and in 2002 and 2003, a total of 1,574 pen-reared Arctic grayling were released into the

Nome River. The population was reassessed in 2005 to estimate the abundance and contribution of pen-reared fish into the Nome River. Although the number of small fish captured was insufficient to estimate abundance, more were captured than in past assessments, indicating that there may be an increase in smaller Arctic grayling in this river. By 2009, it was believed that these fish should be large enough to be recruited to the sampling gear for a stock assessment to estimate abundance. In June 2009, catches were so low that samples sizes were not met in order to estimate abundance. Other road-accessible populations would be vulnerable to overexploitation if fishing practices and motivations were to change; however, at this time other populations appear to be stable and are able to sustain the current low levels of effort and harvest.

Northwestern Alaska, particularly Seward Peninsula waters, provides some of the best opportunities in the state to capture large-sized Arctic grayling. Under the current regulations, it appears that these trophy fisheries are being maintained. Populations in the Fish and Niukluk rivers have recovered from relatively low levels of abundance in the early 1990s, and the outlook in these rivers is promising. Populations in both the Pilgrim and Sinuk rivers are slightly larger than when last assessed and appear to be sustaining current levels of exploitation, and the population in the Pilgrim River appears stable.

Recent Board of Fisheries Actions

No actions were taken specific to NW/NSMA Arctic grayling fisheries at either the 2010 or 2013 BOF meetings.

Current or Recommended Research and Management Activities

In 2013, a stock assessment project was conducted to estimate abundance of Arctic grayling in a 14 mi (22 km) index area of the Niukluk River from the outlet of the Casadepaga River to the village of Council. Using mark-recapture techniques, 10,715 fish (SE = 1,369) ≥350 mm FL were estimated in this index area (Gryska *In prep* b), well above the desired minimum abundance of 3,500 fish ≥350 mm FL for this index area. No other stock assessment projects on Nome roadside Arctic grayling populations are planned for the near future. A management plan is being updated to specifically address Nome roadside Arctic grayling fisheries using bag and possession limits based on specific threshold abundances, in addition to the use of precision criteria for estimates of abundance generated from future stock assessments (Scanlon *In prep*).

KOTZEBUE SOUND SHEEFISH

Background and Historical Perspective

Within the NW/NSMA, spawning stocks of sheefish occur only in the Kobuk and Selawik rivers (Alt 1975) with the exception of a small population that resides in the Koyuk River of Norton Bay. Sporadic catches of sheefish have been recorded in the Serpentine River upstream of Shishmaref, but it is not known if they spawn there (Jim Magdanz, Area Biologist, ADF&G, Nome, personal communication).

The drainages of Kotzebue Sound are known for the large size of sheefish available to the sport angler. These remote trophy sport fisheries are considered by many to be among the pinnacle of Alaskan freshwater sport fishing. Since the inception of ADF&G's Trophy Fish Program in 1967, all but 1 of the qualifying sheefish have come from the Kobuk River.

Kotzebue Sound sheefish are distributed throughout the nearshore estuarine areas of Kotzebue Sound. The major concentration occurs in Hotham Inlet but also occurs in the Sheshalik and Krusenstern areas and in southern Kotzebue Sound (Figure 5). Nearly all sheefish occupying the estuarine environment during summer are immature or nonspawning adults. Adult prespawning fish move upstream during summer on the Kobuk and Selawik rivers to spawn in the fall. The Kobuk River stock spawns upstream from the village of Kobuk, with the greatest observed concentrations between the Mauneluk River and Beaver River. After spawning is complete in late September or early October, fish disperse to downstream overwintering areas. Tag recoveries have shown that the 2 stocks mix in Hotham Inlet winter habitats but maintain fidelity to their spawning areas.

Kotzebue Sound sheefish support subsistence, commercial, and sport fisheries. Subsistence fishing is given priority and is currently unrestricted, with little reliable harvest reporting. The commercial fishery and much of the subsistence harvest takes place through the ice while sport fisheries are mainly summer and fall activities. The same populations of sheefish contribute to all harvests. The annual commercial sales of sheefish in Kotzebue ranged from 0 to 850 fish between 1991 and 2004, no commercial catch was reported for the years 2006–2010, and less than 4 fishermen participated in the commercial fishery in 2005 and 2011 (Menard et al. 2013). The estimated subsistence harvest in the villages of the Kobuk River averaged about 6,700 fish for the years 2000–2004 (Georgette and Shiedt 2005). Not all villages were surveyed during 2001 and 2002, so the harvest estimate should be considered a minimum. In 2004, the subsistence sheefish harvest was estimated at 10,163 fish. These surveys were not conducted for the years 2005–2011. Because subsistence practices have not changed appreciably in recent years, it is likely that Kobuk River subsistence harvests reflect trends in the spawning population of sheefish. Winter gillnet harvests from the fishery near Kotzebue were estimated at about 15,000 fish in 1995/1996 and 14,000 fish in 1996/1997 (Taube and Wuttig 1998). During the winter of 2000/2001, a complete census of participants in the winter fishery documented the harvest at 14,533 fish (Savereide 2002). Sheefish are also taken by jigging lures under the ice in Hotham Inlet and Selawik Lake, but harvests are undocumented. Overall, it is likely that 15,000–25,000 sheefish are taken for subsistence annually in Northwestern Alaska.

The Division of Sport Fish conducted studies of the ecology, movements, and growth of sheefish between 1966 and 1979. Much of this work was conducted in Northwestern Alaska and was summarized by Alt (1987). After conducting a feasibility experiment in 1994, ADF&G Division of Sport Fish, in cooperation with the NPS, began a project to estimate abundance of sheefish spawning in the Kobuk River. This project continued through 1997 and established baseline estimates on spawner abundance, age, size, and sex composition of the spawning population. Tag-recovery data indicated that although some sheefish were capable of spawning in consecutive years, most spawned every other year. However, more recent results from radiotelemetry research conducted on the Kobuk River sheefish population showed that anywhere from 18% to 49% of Kobuk River sheefish exhibit sequential-year spawning, including males and females. This evidence suggests that Kobuk River sheefish choosing a particular spawning strategy are not solely influenced by the energetic requirements needed to spawn (Savereide 2013). Spawner abundance in the Kobuk River was estimated at approximately 32,000 fish in 1995, 43,000 fish in 1996, and 33,000 fish in 1997 (Taube and Wuttig 1998). The USFWS (Underwood et al. 1998) estimated the abundance of sheefish spawning in the Selawik River at 5,200 fish in 1995 and 5,150 fish in 1996. Anecdotal reports based on catches by residents of Kotzebue, Sheshalik, and Kobuk River villages indicate that

there are more sheefish now than ever in the last 25 years. The USFWS repeated abundance estimates in the Selawik River in 2004 and 2005. Estimates indicated that spawner abundance was approximately 24,000 fish in 2004 and 46,000 fish in 2005 (Hander et al. 2008). Most of the increase was in the smaller size classes of spawners and indicates strong recruitment into the spawning population. If similar increases are occurring in the Kobuk stock, the anecdotal reports of high sheefish abundance are indeed correct.

Most sheefish sport fishing effort in the NW/NSMA occurs on the Kobuk River spawning population. Most areawide subsistence and commercial harvest of sheefish occur on the entire (spawners and nonspawners) population. When taken in combination, recent annual sport harvests of about 650 fish are easily sustainable (Table 16). Although spawner abundances have been estimated, the total size of the areawide population is not known, and the sport harvest must be viewed in relation to other ongoing harvests. Recent data support the assumption that subsistence harvests are much greater than either commercial or sport harvests (Menard et al. 2013). In order to ensure sustained yields from these population(s), a management approach involving subsistence and commercial fisheries for sheefish is recommended. Sheefish are very fecund fish with some large females containing over 400,000 eggs. Such populations may be subject to episodic recruitment events depending on environmental conditions. If spawner abundances are maintained above some threshold level, intermittent years of good recruitment should carry the population through years when environmental conditions are less favorable.

Recent Fishery Performance

Estimated annual sport harvests of sheefish by anglers in Northwestern Alaska since 1993 have fluctuated from a high of about 2,500 fish to a low of about 60 fish with an average annual harvest of 611 fish for the years 2007–2011 (Table 16). In 2012, the harvest was 104 fish and the catch was 259 fish, both well below recent averages (Table 16). Average sheefish catch for the years 2007–2011 was 2,149 fish, indicating that about 72% of all sheefish captured in Northwestern Alaska by sport anglers are released. In a 1997 experiment to determine hooking mortality rates of sheefish in the Kobuk River, the mortality of fish caught and released on sport fishing gear was found to be low (3.3% for treble-hook lures and 1.7% for single-hook lures; Stuby and Taube 1998). Overall, mortality was 2.4%. In spite of the worldwide reputation of this destination, the level of fishing effort is still quite low. The 5-year (2007–2011) average effort on the Kobuk River was 1,532 angler-days (Table 4). The Kobuk River accounted for about 32% of the overall estimated freshwater sport fishing effort in the Kotzebue subarea (4,970 total angler-days) in 2012 (Table 4).

Fishery Objectives and Management

The Kobuk River sheefish fishery is managed to maintain opportunity to participate in this unique high-quality sport fishery while keeping harvests from spawning areas low. In order to accommodate local use of this resource downstream from major spawning areas, the bag limit is 10 sheefish downstream of the Mauneluk River. In the spawning area upstream of the Mauneluk River, the bag and possession limit is 2 fish. The majority of anglers visiting the Kobuk River to fish for sheefish use the area upstream of the Mauneluk River. The Selawik River has similar regulations, with the bag and possession limit of 10 sheefish downstream of the Tagagawik River, and a bag and possession limit of 2 sheefish upstream of this tributary.

Current Issues and Fishery Outlook

Alaska Native residents of Kobuk River villages have expressed concern over some practices of sport anglers on the Upper Kobuk River in the vicinity of the sheefish spawning grounds. Catch-and-release fishing is considered by some local residents to be disrespectful and damaging to the fish. Discarding filleted carcasses in the water is thought by some to drive other sheefish away from the area. Catch-and-release fishing is viewed as a conservation tool by ADF&G and by many anglers, and although sheefish may be sensitive to rough handling, ADF&G has demonstrated that they can be released without significant mortality. An educational brochure explaining proper catch-and-release techniques for sheefish was developed in association with the NPS in Kotzebue and is made available to those fishing on the Upper Kobuk River. It is hoped that with proper handling, impacts of catch-and-release fishing to the spawning population can be minimized.

The outlook for sheefish fisheries in Northwestern Alaska is good in the immediate future. Although overall harvest levels are substantial, populations and spawner abundances appear stable and sport harvests are low.

Recent Board of Fisheries and Management Actions

No proposals were submitted specific to the Northwest Area sheefish fisheries for the 2010 and 2013 BOF meetings.

Current or Recommended Research and Management Activities

Recent research conducted cooperatively with the USFWS and the NPS has provided substantial background data on spawner abundance for the 2 stocks comprising the Kobuk-Selawik sheefish population. These data will be used as a baseline for comparing future population assessments. In 2008, ADF&G, in cooperation with USFWS, began a 5-year study on the Kobuk River sheefish population using radiotelemetry to determine spawning locations, spawning frequency, and timing of postspawner outmigration to Hotham Inlet (Savereide 2013). In 2011, USFWS began a study of the genetic composition of the wintertime subsistence harvest in Hotham Inlet, specifically to see what proportion comes from the Selawik River stock and what proportion is from the Kobuk River. Unfortunately, the number of samples from each population did not provide sufficient differentiation to perform mixed-stock analysis at the level needed for this study, and simulation results indicated additional baseline samples were needed (Hander et al. 2013a).

In 2004, a permafrost slump located approximately 31 mi (50 km) upstream from the Selawik River spawning area for sheefish began to emit a large amount of silt into the river, and it has continued to erode during the open water season. It has been speculated that the effects could potentially affect spawning success for sheefish in the Selawik River by clogging interstitial spaces in the gravel and cobble substrate where fertilized eggs are thought to settle and develop through the winter (Waters 1995). In fall 2011, USFWS initiated an experiment to look for any effects of the thaw slump on recruitment and survival of eggs deposited after the slump occurred, using the Kobuk River population as a control. Comparison of cumulative age distributions of Selawik and Kobuk River collections for 2011 and 2012 indicated a younger sample from the Kobuk River in both years (Hander et al. 2013b). Preliminary counts of Selawik River sheefish spawners were made using sonar during their late-September to mid-October post-spawning migration to their wintering grounds in 2011 (n = 20,800) and 2012 (n = 16,628). Ice flow halted

sonar operations in both years because of ice forming on the sonar and the inability to protect it from damage. Therefore, these spawning population counts were minimum values because it was likely that at least a small portion of the post-spawning migration continued after sonar operations ceased (Hander et al. 2013b). This project is scheduled to continue through 2015.

NORTH SLOPE DOLLY VARDEN AND ARCTIC CHAR

Background and Historical Perspective

In the North Slope subarea of the NW/NSMA, Arctic char occur in lakes on the north-facing side of Brooks Mountain Range, and the closely-related Dolly Varden are common inhabitants of most large rivers on the North Slope in most drainages of the eastern coastal plain from the Canadian Border to the Colville River. ADF&G groups Dolly Varden and Arctic char together for regulatory purposes, primarily because of the difficulty of distinguishing between them based solely on physical appearance; however, the 2 species have distinct life history traits. Because distribution of Arctic char is limited in the North Slope subarea, essentially all fisheries are directed toward Dolly Varden.

Dolly Varden are a major component of the harvest and catch in the North Slope area, contributing more than 25% of the harvest and 23% of the catch for the primary sport species for the years 2002–2011 (Table 17). On the North Slope, most sport fisheries for char target overwintering populations of Dolly Varden either in the fall as the fish return to freshwater from the sea or in the spring as they move toward the sea to feed, although some prespawning fish are caught in late summer.

On the North Slope, Dolly Varden spawn and overwinter in upwelling areas. Dolly Varden become increasingly concentrated in the spring areas beneath and adjacent to the inriver glaciers (*aufeis*) that form during winter. Streams that are known to support significant populations of Dolly Varden in the North Slope subarea include the Ivishak, Kongakut, Hulahula, Canning, Sagavanirktok, and Anaktuvuk rivers (Figure 6). Overwintering locations are, in some cases, different from spawning locations such that nonspawning fish from several neighboring tributaries may concentrate in a single drainage. The Upper Ivishak River, a tributary of the Sagavanirktok River, provides a large overwintering area used by fish in nonspawning years from nearby tributaries such as the Ribdon, Lupine, and Echooka rivers.

The population of Dolly Varden using the Sagavanirktok River is considered potentially vulnerable because of habitat degradation resulting from oil and gas development that has occurred in Prudhoe Bay (Sagavanirktok River Delta). Access for anglers to the migratory route of this stock is provided by the Dalton Highway, which parallels most of the mainstem of the Sagavanirktok River. In 1994, the entire length of the Dalton Highway was opened to public travel. Prior to this, the North Slope portion of the road was technically open only as far north as the Wiseman area in the Upper Koyukuk River drainage.

Aerial surveys of index areas in several North Slope rivers have been conducted since 1971 to monitor the Dolly Varden stocks (Table 18). Research conducted by ADF&G and funded by USFWS-OSM for the years 2001–2003 used radiotelemetry, mark-recapture abundance estimates, and aerial surveys to demonstrate that aerial surveys of overwintering aggregations of Dolly Varden in North Slope drainage can be used as an indicator of overwintering abundance (Viavant 2001–2003, 2005, 2008, 2009).

A large increase in fishing effort and catch of Dolly Varden and the other 2 key sport species (Arctic grayling and lake trout) was anticipated with the opening of the entire length of the Dalton Highway to public travel in 1994 and again with the improvement of the roadway south of Atigun Pass in 2001 and 2002. Estimates from the SWHS do not indicate that this increase has occurred (Table 18).

Recent Fishery Performance

Estimates of catch and harvest of Dolly Varden from the North Slope subarea suggest a stable level of use. Total average annual catch has been 2,685 fish and average harvest has been 393 fish for the years 2002–2011 (Table 17). In 2012, harvest was estimated to be 594 Dolly Varden, with a total catch of 4,973 fish. Historically, about 50% of the total catch and harvest of Dolly Varden has come from waters adjacent to the Dalton Highway.

Fishery Objectives and Management

Fishery management for Dolly Varden and Arctic char reflects the different life history characteristics that these 2 closely related species exhibit. Dolly Varden (which inhabit streams and are often anadromous) can be exploited at much higher rates than can lake-dwelling Arctic char. The life history characteristics of lake-dwelling Arctic char are very similar to lake trout, and it is likely that most of these populations can support only low rates of exploitation.

In lakes, Arctic char are managed to provide a conservative level of yield. In streams, Dolly Varden are managed to encourage participation in the fishery while limiting harvest of spawning adults.

Current Issues and Fishery Outlook

There is a concern among indigenous people of the North Slope that a growing sport fishery for Dolly Varden may conflict with local subsistence fisheries.

Oil and gas development adjacent to and within the migration routes of Dolly Varden in North Slope waters carries the potential for serious effects through contamination or alteration of habitat. Dolly Varden using the Sagavanirktok River drainage pass through Prudhoe Bay, one of the most heavily industrialized areas in Alaska. Current plans for oil and gas leases in the foothill region of National Petroleum Reserve-Alaska are of particular concern. These new lease areas include the critical overwintering–spawning habitat in the spring areas of the Anaktuvuk River drainage. Seismic surveys are planned for the portions of the Sagavanirktok, Anaktuvuk, and Canning rivers that are the primary spawning and overwintering habitats for these Dolly Varden stocks. ADF&G staff continue to assert that these critical habitats must be excluded from all surface development and that travel routes must be redirected.

Recent studies in the Sagavanirktok River drainage (Viavant 2005) indicated a declining abundance of overwintering and spawning Dolly Varden (Table 18); however, these surveys have not been conducted since 2008 and therefore more recent abundances are not known. Fluctuations in the abundance of Dolly Varden stocks on the North Slope have been reported before (Yoshihara 1973; Bendock and Burr 1984).

The results from the radiotelemetry study show that the specific locations of critical spawning and overwintering habitat used by anadromous Dolly Varden in the Beaufort Sea drainages may change significantly between years within a relatively large area within a drainage (Viavant

2003). Protection of such habitat should not be based on locations determined from only one or a few seasons.

Dolly Varden will probably continue to provide a substantial portion of the sport fishery that occurs on the North Slope. The waters within the Dalton Highway corridor will continue to support most of the total catch and harvest of Dolly Varden in the North Slope subarea. Increased numbers of visitors are reportedly taking float trips on streams (Kongakut, Hulahula, Canning rivers) in ANWR. Modest increases in catch and harvest of Dolly Varden can be anticipated with the increased visitor use of the area.

Recent Board of Fisheries Actions

No proposals were submitted specific to the North Slope Dolly Varden/Arctic char fisheries for the 2010 and 2013 BOF meetings.

Current or Recommended Research and Management Activities

Establishment of annual aerial index counts of the Ivishak and Anaktuvuk rivers overwintering areas is recommended. Annual monitoring of these stocks is important, particularly in light of apparent declining abundance of Dolly Varden in the area and the increased oil and gas development activity in this area.

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TABLES AND FIGURES

Table 1.–Commercial salmon harvest from the Norton Sound and Kotzebue districts, 1993–2012.

	Norton Sound					Kotzebue	
Year	King	Sockeye	Coho	Pink	Chum	Chum	Dolly Varden
1993	8,972	279	43,283	157,574	53,562	73,071	76
1994	5,285	80	102,140	982,389	18,290	153,452	149
1995	8,860	128	47,862	81,644	42,898	290,730	2,090
1996	4,984	1	68,206	487,441	10,609	82,110	188
1997	12,573	161	32,284	20	34,103	142,720	3,320
1998	7,429	7	29,623	588,013	16,324	55,907	349
1999	2,508	0	12,662	0	7,881	139,120	1,502
2000	752	14	44,409	166,548	6,150	159,802	7
2001	213	44	19,492	0	11,100	211,672	0
2002	5	1	1,759	0	600	8,390	30
2003	12	21	17,060	0	3,560	25,423	176
2004	22	47	42,016	0	6,296	51,038	124
2005	151	12	85,523	0	3,983	75,971	181
2006	20	3	130,808	0	10,042	137,961	278
2007	19	2	126,136	3,769	22,431	147,087	960
2008	83	60	120,309	75,525	25,124	190,550	1,629
2009	84	126	87,041	17,364	34,122	187,562	960
2010	140	103	62,079	31,557	117,743	270,343	1,323
2011	185	369	58,917	7,141	110,555	264,321	400
2012	197	134	37,056	205,498	62,772	227,965	300
2002–2011 Average	**72**	**74**	**73,165**	**13,536**	**33,446**	**135,865**	**606**
2007–2011 Average	**102**	**132**	**90,896**	**27,071**	**61,995**	**211,973**	**1,054**

Source: Menard et al. 2013.

Table 2.–Salmon escapement goals and documented salmon escapements in Norton Sound, 2002–2012.

River/Fish	Escapement Goal	Type	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Nome River													
Chum	2,900-4,300	SEG-Weir	1,720	1,958	3,903	5,584	4,128	7,034	2,607	1,565	5,906	3,582	1,987 [b]
Pink	>13,000 (even years)	SEG-Weir	35,057	11,402	1,051,146	285,759	611,550	24,395	1,186,554	16,490	171,760	14,403	149,119 [b]
Coho			3,418	548	2,283	5,848	8,126	2,437	4,605	1,370	4,114	1,833	224 [b]
Snake River													
Chum	1,600-2,500	SEG-Weir	2,669	2,179	2,145	2,967	4,128	8,147	1,244	891	6,973	4,343	673 [b]
Pink			4,042	2,829	126,917	13,813	73,734	4,634	145,761	769	51,099	7,011	5,954 [b]
Coho			396	489	474 [a]	2,925	4,926	1,781	5,206	50 [b]	2,243	343 [b]	14 [b]
Eldorado River													
Chum		SEG-Weir	10,260	3,589	3,273	10,426	41,985	21,312	6,746	4,943	21,211	16,227	13,348 [b]
Pink			115,652	173	60,861	12,356	22,368	833	244,641	1,119	48,316	489	59,318 [b]
Coho			516	115	1,149	679	523	2	38	2	2	1	0 [b]
Pilgrim River													
Chum			5,538	15,192	10,228	9,715	45,410	35,334	25,008	5,427	25,379	41,740	25,521
Pink			3,870	14,100	50,757	13,298	18,701	3,616	92,641	483	29,237	3,364	46,134
Coho			216	677	1,556	304	962	605	260	18	272	269	95
Sockeye (Salmon Lake)	4,800-9,600	SEG-Aerial	4,012	42,729	85,520	56,484	52,223	43,432	20,448	953	1,654	8,849	7,085
Niukluk River													
Chum	>23,000	SEG-Tower	20,018	10,158	10,791	25,596	29,199	50,994	12,078	15,879	48,561	23,607	19,576
Pink	>10,500	SEG-Tower	636,404	75,855	1,022,302	270,424	1,371,919	43,617	669,234	24,204	434,205	15,425	249,212
Coho	2,400-6,100	SEG-Tower	7,269	1,282	1,833 [b]	2,727	11,169	3,498	13,779	6,861	9,042	2,405	1,729 [b]
North River													
Chinook	1,200-2,600	SEG-Tower	1,484	1,452	1,105	1,019	906	1,950	903	2,352	1,256	864	996
Chum			5,918	9,859	9,624	11,984	5,385	8,046	9,502	9,783	16,131	19,898	9,042 [b]
Pink	>25,000	SEG-Tower	321,756	280,212	1,149,294	1,670,934	2,169,890	583,320	240,286	189,939	150,807	123,892	147,674 [b]
Coho			2966 [b]	5,837	9,646	19,189	9,835	19,944	15,648	22,226	7,608	3,624	3,036 [b]
Kwiniuk River													
Chinook	300-550	SEG-Tower	1,632	749	645	342	195	258	237	444	135	57	54
Chum	10,000-20,000	OEG-Tower	37,864	12,117	10,371	12,083	39,519	27,756	9,462	8,739	71,388	31,604	5,577 [b]
Pink	>8,400	SEG-Tower	1,114,616	22,332	3,045,915	341,048	1,347,090	54,255	1,442,237	42,960	634,220	30,023	393,302 [b]
Coho	650-1,300	SEG-Aerial	6,459	5,484	10,523	12,950	22,341	9,429	10,680	9,036	8,049	3,288	777 [b]

[a] Incomplete count because of high water; 1,916 coho salmon counted by aerial survey in the Snake River.

[b] Incomplete count because of high water or tower not run through end of season.

Table 3.–Subsistence salmon harvest in the Norton Sound, Port Clarence, and Kotzebue Districts, 1993–2012.

	Norton Sound						Port Clarence						Kotzebue
Year	King	Sockeye	Coho	Pink	Chum	Total	King	Sockeye	Coho	Pink	Chum	Total	Chum
1993	420	80	3,287	2,599	3,401	9,787	ND	ND	ND	ND	ND	ND	15,430
1994	7,375	1,162	22,124	71,065	25,120	126,846	ND	ND	ND	ND	ND	ND	36,226
1995	7,284	3,595	21,620	38,134	41,259	111,892	181	1,979	1,692	3,849	2,042	9,743	102,881
1996	7,255	1,181	26,305	64,724	34,586	134,051	76	4,481	1,739	3,293	6,011	15,600	99,740
1997	8,903	1,045	14,505	24,549	25,249	74,251	195	4,558	2,079	2,587	1,264	10,683	57,906
1998	6,242	393	13,743	46,480	14,010	80,868	158	3,177	829	755	2,099	7,018	48,980
1999	4,331	866	12,233	19,193	13,049	49,672	287	1,665	1,759	7,812	2,621	14,144	94,342
2000	3,690	324	13,455	37,864	12,989	68,322	89	2,392	1,030	786	1,936	6,233	65,975
2001	4,751	750	11,293	29,822	13,963	60,579	72	2,851	935	1,387	1,275	6,520	49,232
2002	4,792	443	11,773	56,311	13,095	86,414	74	3,692	1,299	1,183	1,910	8,158	16,880
2003	4,728	522	11,446	46,336	9,498	72,530	133	3,732	2,194	3,394	2,699	12,152	19201
2004	4,419	458	10,892	70,945	3,592	90,306	177	4,495	1,434	4,113	2,430	12,649	24,637
2005	4,848	914	16,127	60,427	13,765	96,081	276	8,288	1,031	5,817	2,501	17,913	10,616
2006	2,876	572	17,242	56,579	5,992	83,261	152	8,492	726	6,615	2,479	18,464	ND
2007	2,646	938	12,023	21,039	12,048	48,694	85	9,484	705	1,468	4,454	16,196	4,568
2008	2,465	363	17,604	54,927	8,709	84,068	125	5,166	562	7,652	2,517	16,022	ND
2009	4,222	394	17,121	26,610	11,337	60,384	40	1,643	804	1,882	3,060	7,429	ND
2010	2,120	546	11,863	42,254	16,201	72,987	63	824	596	5,202	5,232	1,197	ND
2011	1,359	414	8,538	17,166	14,566	42,043	57	1,611	393	2,610	4,338	9,009	ND
2012	1,235	424	9,573	43,551	12,399	67,182	44	1,422	703	5,200	7,802	15,171	ND
2002–2011 Average	**3,258**	**558**	**13,157**	**45,167**	**9,967**	**72,108**	**121**	**5,398**	**843**	**4,357**	**3,400**	**14,118**	**16,322**
2007–2011 Average	**2,394**	**527**	**12,956**	**32,283**	**12,087**	**60,247**	**74**	**3,726**	**602**	**3,738**	**3,907**	**12,047**	**ND**

Note: ND indicates years when no subsistence harvest survey was conducted.

Table 4.–Sport fishing effort (angler-days) by major fisheries and subareas in the NW/NSMA, 1993–2012.

	Seward Peninsula/Norton Sound Subarea								Kotzebue/Chukchi Sea Sub-Area					North Slope Sub-Area			NW/NSMA
Year	Nome	Fish/Niukluk	Unalakleet	Snake	Sinuk	Pilgrim	Other	Total	Noatak	Kobuk	Wulik	Other	Total	Haul Road	Other	Total	Total
1993	3,633	3,962	2,153	1,468	874	1,195	6,519	18,930	3,013	2,604	350	1,842	7,809	3,421	2,179	5,600	32,339
1994	5,116	3,082	2,349	880	1,132	808	6,651	18,922	2,747	1,153	762	1,374	6,036	2,926	2,481	5,407	30,365
1995	3,044	2,603	3,832	1,968	1,295	717	6,947	19,647	2,504	3,681	647	1,663	8,495	3,275	2,369	5,644	33,786
1996	2,920	2,120	2,539	1,269	553	840	4,095	13,783	2,039	1,358	274	1,900	5,571	2,700	1,787	4,487	23,841
1997	1,914	3,017	4,393	445	443	820	3,261	13,850	1,159	825	553	1,192	3,729	3,224	2,054	5,278	22,857
1998	1,371	1,344	3,795	376	123	546	6,184	13,616	765	2,053	202	781	3,801	2,121	1,532	3,653	21,070
1999	1,463	4,825	4,176	977	244	433	3,041	14,915	3,142	2,099	737	793	6,771	2,473	2,757	5,230	26,916
2000	1,455	3,324	6,201	397	294	747	3,385	15,509	1,713	2,298	336	878	5,225	2,325	2,414	4,739	25,473
2001	1,045	2,484	2,793	853	490	491	1,899	9,565	2,702	925	592	1,275	5,494	4,256	1,776	6,032	21,091
2002	1,901	1,646	8,195	514	1,324	562	3,604	16,422	1,218	3,286	610	1,171	6,285	2,224	3,808	6,032	28,739
2003	651	2,273	3,056	701	430	730	4,810	12,221	1,855	2,039	397	1,830	6,121	1,103	1,607	2,710	21,052
2004	1,636	2,786	4,527	468	466	594	2,393	12,404	1,130	2,760	219	1,246	5,355	873	2,438	3,311	21,070
2005	2,142	1,954	4,768	836	549	327	5,044	15,071	1,310	868	493	393	3,064	1,881	2,471	4,352	22,487
2006	4,517	1,049	4,062	855	1,234	337	4,010	14,830	2,538	2,104	993	699	6,334	1,298	1,806	3,104	24,268
2007	3,887	1,483	4,205	1,873	933	240	4,979	16,667	2,935	1,627	205	260	5,027	799	3,355	4,154	25,848
2008	5,272	3,842	5,129	1,740	878	590	5,422	21,995	1,621	1,183	395	1,222	4,421	3,774	1,825	5,599	32,015
2009	2,808	3,813	5,329	564	447	482	4,004	17,000	2,561	3,283	428	1,159	7,431	1,813	2,092	3,905	28,336
2010	2,326	1,844	3,012	1,032	616	248	1,532	10,610	745	955	334	1,436	3,470	3,724	660	4,384	18,464
2011	725	4,738	3,926	405	467	74	1,005	11,340	3,002	613	443	465	4,523	1,746	1,185	2,931	18,794
2012	1,914	2,685	2,957	404	566	76	1,450	10,052	2,593	1,598	246	533	4,970	3,714	1,343	5,057	20,079
2002–2011 Average	**2,587**	**2,543**	**4,621**	**899**	**734**	**418**	**3,680**	**15,482**	**1,892**	**1,872**	**452**	**988**	**5,203**	**1,924**	**2,125**	**4,048**	**24,733**
2007–2011 Average	**3,004**	**3,144**	**4,320**	**1,123**	**668**	**327**	**3,388**	**15,974**	**2,173**	**1,532**	**361**	**908**	**4,974**	**2,371**	**1,823**	**4,195**	**25,143**

Table 5.–Sport fish harvest by species in the NW/NSMA, 1993–2012.

Year	King Salmon	Coho Salmon	Pink Salmon	Chum Salmon	Sockeye Salmon	DollyVarden/ Arctic Char	Lake Trout	Arctic Grayling	Northern Pike	Whitefish	Sheefish	Burbot
1993	576	3,576	1,827	929	10	7,601	340	4,113	1,181	324	631	256
1994	600	5,013	6,106	777	18	5,825	150	2,812	663	196	230	373
1995	347	3,564	966	715	83	4,721	164	2,930	471	421	861	125
1996	406	6,905	5,627	1,238	100	6,112	185	4,815	840	260	485	405
1997	968	3,891	1,276	506	30	5,866	130	4,067	508	631	710	493
1998	545	3,693	4,951	815	16	4,117	252	3,268	270	100	293	259
1999	573	4,719	3,038	603	0	7,927	178	4,053	548	380	628	125
2000	675	6,487	2,439	1,062	32	8,641	134	3,348	768	1,329	664	521
2001	271	4,541	349	3,225	39	5,944	154	3,067	471	2,412	1,056	101
2002	814	4,057	4,070	1,346	0	4,602	305	5,774	535	495	476	244
2003	239	3,050	2,285	553	572	6,257	109	4,373	869	919	735	22
2004	418	5,302	7,549	707	404	5,711	212	3,675	1,583	2,513	652	79
2005	561	7,076	3,004	436	232	3,700	177	2,177	564	514	393	50
2006	427	11,643	5,305	1,592	22	5,613	44	1,483	107	654	607	63
2007	293	6,939	1,631	723	72	5,883	7	1,735	585	1,147	1,066	0
2008	594	11,927	7,567	2,954	209	4,523	0	2,181	566	307	61	130
2009	291	6,579	1,305	652	0	5,747	63	4,604	582	418	946	6
2010	61	5,876	2,712	865	0	2,551	129	1,206	595	398	595	18
2011	61	3,593	566	764	58	5,254	0	2,204	148	20	385	134
2012	0	5,099	3,220	691	28	1,627	237	2,038	781	204	104	0
2002–2011 Average	**376**	**6,604**	**3,599**	**1,059**	**157**	**4,984**	**105**	**2,941**	**613**	**739**	**592**	**75**
2007–2011 Average	**260**	**6,983**	**2,756**	**1,192**	**68**	**4,792**	**40**	**2,386**	**495**	**458**	**611**	**58**

Table 6.–Sport fish catch by species in the NW/NSMA, 1993–2012.

Year	King Salmon	Coho Salmon	Pink Salmon	Chum Salmon	Sockeye Salmon	Dolly Varden/ Arctic Char	Lake Trout	Arctic Grayling	Northern Pike	Whitefish	Sheefish	Burbot
1993	3,074	5,903	5,800	2,729	116	32,798	859	29,329	4,461	681	1,354	278
1994	912	7,049	13,108	2,741	105	20,553	584	20,871	3,273	360	481	633
1995	739	7,288	3,420	3,657	229	18,796	1,374	26,921	3,277	540	2,980	165
1996	2,166	11,735	15,466	8,670	314	21,657	924	29,039	4,662	938	3,152	429
1997	5,379	6,862	5,690	3,454	305	28,861	1,238	44,624	2,845	1,518	2,145	661
1998	1,647	9,288	23,906	5,043	209	21,627	1,403	27,057	1,556	1,350	803	285
1999	948	13,417	3,834	5,612	124	33,149	1,168	41,558	4,086	534	5,077	137
2000	1,779	13,350	11,670	6,966	149	29,596	587	32,703	2,541	2,179	2,628	565
2001	584	8,162	2,002	6,034	53	17,159	1,375	23,840	3,613	2,778	4,786	146
2002	2,032	7,406	13,048	6,708	53	15,833	960	43,826	2,335	951	1,960	244
2003	1,314	6,013	8,818	3,159	1,323	17,474	1,175	33,587	2,230	2,226	5,462	33
2004	2,006	16,698	42,795	3,777	680	17,511	1,139	23,395	4,074	3,409	1,750	144
2005	1,086	24,160	25,830	3,491	346	14,858	1,193	20,866	1,572	1,210	1,043	50
2006	2,592	20,282	24,749	6,950	334	19,721	1,197	14,785	2,316	884	5,051	63
2007	1,034	13,449	6,854	6,841	116	18,535	322	22,153	16,578	1,543	1,639	105
2008	823	28,338	39,416	10,513	446	25,512	21	23,145	3,508	1,346	482	188
2009	623	17,338	8,197	5,379	112	25,465	184	30,878	3,061	1,226	5,050	6
2010	99	14,245	8,244	3,743	0	12,845	258	23,318	3,228	1,621	2,928	43
2011	574	12,042	3,134	6,098	72	17,283	0	12,675	691	555	647	142
2012	17	9,430	7,062	4,442	28	11,890	428	25,459	5,481	363	265	0
2002–2011 Average	**1,218**	**15,997**	**18,109**	**5,666**	**348**	**18,504**	**645**	**24,863**	**3,959**	**1,497**	**2,601**	**102**
2007–2011 Average	**631**	**17,082**	**13,169**	**6,515**	**149**	**19,928**	**157**	**22,434**	**5,413**	**1,258**	**2,149**	**97**

Table 7.–King salmon sport harvest and catch in Seward Peninsula/Norton Sound rivers, 1993–2012.

	Harvest								
Year	Nome	Pilgrim	Unalakleet	Fish-Niukluk	Sinuk	Snake	Solomon	Other	Total
1993	93	28	382	9	9	9	28	37	595
1994	0	0	379	10	0	0	0	211	600
1995	0	19	259	18	0	0	0	142	438
1996	0	0	384	11	0	0	0	267	662
1997	10	45	842	71	0	0	0	138	1,106
1998	0	32	513	0	0	0	0	45	590
1999	0	0	415	44	0	0	0	171	630
2000	0	0	345	174	0	0	0	370	889
2001	0	0	250	0	0	0	0	84	334
2002	0	0	544	75	0	0	0	183	802
2003	0	103	97	39	0	0	0	0	239
2004	0	0	356	22	0	0	0	157	535
2005	0	0	216	37	0	0	0	308	561
2006	0	0	394	0	0	0	0	33	427
2007	0	0	147	0	0	0	0	130	277
2008	0	0	580	0	0	0	0	0	580
2009	13	0	248	30	0	0	0	0	291
2010	0	0	61	0	0	0	0	0	61
2011	0	0	53	0	0	0	0	8	61
2012	0	0	0	0	0	0	0	0	0
2002–2011 Average	**1**	**10**	**270**	20	**0**	**0**	**0**	**82**	**383**
2007–2011 Average	**3**	**0**	**218**	6	**0**	**0**	**0**	**28**	**254**

	Catch								
Year	Nome	Pilgrim	Unalakleet	Fish-Niukluk	Sinuk	Snake	Solomon	Other	Total
1993	121	92	2,340	9	9	9	47	440	3,067
1994	0	0	517	29	0	60	0	271	877
1995	0	19	588	18	0	0	0	224	849
1996	21	0	2,059	64	0	0	0	277	2,421
1997	20	90	5,144	125	0	0	0	138	5,517
1998	19	32	1,539	15	0	0	17	98	1,720
1999	0	20	669	55	0	0	0	279	1,023
2000	0	0	1,045	207	0	0	57	711	2,020
2001	0	0	542	21	0	0	0	105	668
2002	24	0	835	111	0	0	0	1026	1,996
2003	0	268	505	515	0	0	0	13	1,301
2004	0	0	1,930	22	0	0	0	401	2,353
2005	0	0	431	74	0	0	0	569	1,074
2006	0	0	2,511	0	0	0	0	65	2,576
2007	0	0	776	0	0	0	0	162	938
2008	0	0	796	0	0	0	0	0	796
2009	13	0	515	95	0	0	0	0	623
2010	0	0	99	0	0	0	0	0	99
2011	0	0	534	32	0	0	0	8	574
2012	0	0	17	0	0	0	0	0	17
2002–2011 Average	**4**	**27**	**893**	**85**	**0**	**0**	**0**	**224**	**1,233**
2007–2011 Average	**3**	**0**	**544**	**25**	**0**	**0**	**0**	**34**	**606**

Table 8.–Coho salmon sport harvest and catch in Seward Peninsula/Norton Sound rivers, 1993–2012.

	Harvest								
Year	Nome	Pilgrim	Unalakleet	Fish-Niukluk	Sinuk	Snake	Solomon	Other	Total
1993	602	191	643	1,185	96	248	420	398	3,783
1994	326	134	2,425	1,122	109	145	235	1,051	5,547
1995	143	113	2,033	818	19	85	38	456	3,705
1996	598	133	3,411	1,652	189	426	142	738	7,289
1997	295	0	2,784	462	0	98	10	744	4,393
1998	189	6	2,742	316	0	0	0	1,188	4,441
1999	219	33	2,691	1,365	0	209	22	1,043	5,582
2000	342	179	4,150	1,165	11	209	32	1,353	7,441
2001	297	29	2,766	969	62	175	39	465	4,802
2002	217	0	2,937	298	0	35	0	724	4,211
2003	68	113	1,604	216	0	11	0	1,027	3,039
2004	270	45	3,524	291	13	163	90	1,410	5,806
2005	1,001	48	3,959	400	230	182	0	2,079	7,899
2006	2,768	150	4,985	948	191	414	156	2,671	12,283
2007	797	118	4,117	786	54	142	337	546	6,897
2008	1,793	57	6,029	1,986	322	563	63	1,134	11,947
2009	229	15	5,027	928	74	55	130	121	6,579
2010	602	40	3,006	1,069	210	131	122	696	5,876
2011	68	0	2,493	700	15	9	0	297	3,582
2012	259	0	3,283	1,163	20	103	20	251	5,099
2002–2011 Average	**781**	**59**	**3,768**	**762**	**111**	**171**	**90**	**1,071**	**6,812**
2007–2011 Average	**698**	**46**	**4,134**	**1,094**	**135**	**180**	**130**	**559**	**6,976**

	Catch								
Year	Nome	Pilgrim	Unalakleet	Fish-Niukluk	Sinuk	Snake	Solomon	Other	Total
1993	764	325	1,572	1,804	143	306	650	583	6,147
1994	386	436	2,488	1,448	172	235	255	2,317	7,737
1995	228	472	3,086	1,401	113	245	208	1,733	7,486
1996	788	265	5,863	3,348	246	530	237	1,196	12,473
1997	447	49	4,020	1,751	196	118	39	867	7,487
1998	863	65	3,213	772	0	64	59	5,123	10,159
1999	231	77	9,593	2,151	0	606	185	1,540	14,383
2000	385	200	9,287	2,952	21	209	53	1,273	14,380
2001	377	29	5,399	1,739	96	214	39	629	8,522
2002	549	5	3,691	1,549	53	156	35	1,522	7,560
2003	90	203	2,832	1,447	0	11	0	1,603	6,186
2004	428	124	12,655	1,653	13	307	90	2,376	17,646
2005	1,523	48	14,396	1,586	742	325	0	7,563	26,183
2006	4,607	185	9,397	1,320	1,428	597	156	3,232	20,922
2007	919	201	8,967	1,014	184	184	381	1,547	13,397
2008	2,507	222	11,511	7,752	749	941	94	4,488	28,264
2009	270	15	14,425	2,095	131	55	193	136	17,320
2010	680	106	8,968	1,273	558	131	159	2,370	14,245
2011	68	0	9,802	1,279	15	9	0	654	11,827
2012	623	0	6,696	1,657	20	144	20	270	9,430
2002–2011 Average	**1,164**	**111**	**9,664**	**2,097**	**387**	**272**	**111**	**2,549**	**16,355**
2007–2011 Average	**889**	**109**	**10,735**	**2,683**	**327**	**264**	**165**	**1,839**	**17,011**

Table 9.–Pink salmon sport harvest and catch in Seward Peninsula/Norton Sound rivers, 1993–2012.

	Harvest								
Year	Nome	Pilgrim	Unalakleet	Fish-Niukluk	Sinuk	Snake	Solomon	Other	Total
1993	723	0	89	278	115	151	259	635	2,250
1994	4,103	154	402	231	145	452	256	1,308	7,051
1995	230	0	222	136	28	19	87	206	928
1996	3,280	49	59	404	285	659	0	1,236	5,972
1997	83	0	1,055	58	54	0	15	193	1,458
1998	1,985	0	434	0	0	463	154	3,903	6,939
1999	0	0	2,946	80	0	0	0	13	3,039
2000	578	6	961	51	10	103	113	1,064	2,886
2001	0	0	188	161	0	0	0	11	360
2002	312	0	1,378	254	0	0	0	2,359	4,303
2003	12	437	29	196	0	0	97	1,451	2,222
2004	3,369	0	2,003	353	156	60	0	2,368	8,309
2005	1,193	23	473	58	62	12	23	1,183	3,027
2006	2,422	67	891	134	330	430	100	943	5,317
2007	402	0	618	30	0	0	281	270	1,601
2008	2,954	0	2077	969	175	539	141	1,404	8,259
2009	178	0	579	23	12	35	12	466	1,305
2010	1,716	0	535	99	49	121	63	134	2,717
2011	85	0	391	10	0	0	0	80	566
2012	1,264	0	20	636	329	152	0	819	3,220
2002–2011 Average	**1,264**	**53**	**897**	**213**	**78**	**120**	**72**	**1,066**	**3,763**
2007–2011 Average	**1,067**	**0**	**840**	**226**	**47**	**139**	**99**	**471**	**2,890**

	Catch								
Year	Nome	Pilgrim	Unalakleet	Fish-Niukluk	Sinuk	Snake	Solomon	Other	Total
1993	1,756	392	605	909	547	429	633	1,126	6,397
1994	6,190	350	1,020	2,052	348	648	784	2,867	14,259
1995	980	58	799	300	125	300	190	521	3,273
1996	5,898	364	2,594	3,512	736	967	39	1,928	16,038
1997	190	0	4,101	1,209	76	0	74	304	5,954
1998	3,482	263	4,853	3,252	0	463	433	13,023	25,769
1999	13	0	3,475	187	0	0	13	147	3,835
2000	876	109	3,982	3,989	21	103	288	2,618	11,986
2001	32	0	1,197	279	11	21	407	748	2,695
2002	3,090	0	2,463	772	0	0	192	6,881	13,398
2003	73	1,044	3,762	626	68	0	97	3,294	8,964
2004	6,189	163	10,332	10,176	1,352	223	195	15,430	44,060
2005	2,095	38	8,778	1,283	279	70	47	13,324	25,914
2006	6,242	134	4,791	700	2,327	1790	267	8,294	24,545
2007	745	0	4,256	178	121	234	311	909	6,754
2008	8,785	49	15,470	3,491	1,202	810	236	8,587	38,630
2009	238	0	5,593	351	133	35	47	1,404	7,801
2010	2,206	0	3,074	674	581	264	329	1,066	8,194
2011	85	0	2,301	10	0	0	80	658	3,134
2012	2,576	0	814	1,257	632	152	0	1,565	6,996
2002–2011 Average	**2,975**	**143**	**6,082**	**1,826**	**606**	**343**	**180**	**5,985**	**18,139**
2007–2011 Average	**2,412**	**10**	**6,139**	**941**	**407**	**269**	**201**	**2,525**	**12,903**

Table 10.–Chum salmon sport harvest and catch in Seward Peninsula/Norton Sound rivers, 1993–2012.

	Harvest								
Year	Nome	Pilgrim	Unalakleet	Fish-Niukluk	Sinuk	Snake	Solomon	Other	Total
1993	0	0	116	514	0	0	0	61	691
1994	0	0	220	119	0	7	0	190	536
1995	0	73	207	27	0	0	0	87	394
1996	0	0	463	166	0	0	0	33	662
1997	0	0	228	0	0	0	0	50	278
1998	0	0	447	0	0	0	0	235	682
1999	0	0	211	0	0	0	0	0	211
2000	0	0	403	0	0	0	0	694	1,097
2001	0	0	714	439	0	0	0	556	1,709
2002	0	0	607	45	0	0	0	166	818
2003	0	0	191	101	0	0	0	0	292
2004	0	0	47	435	0	0	0	16	498
2005	0	0	36	0	0	0	0	294	330
2006	0	0	224	0	0	0	0	120	344
2007	0	0	85	11	0	0	0	9	105
2008	0	0	175	166	0	0	0	414	755
2009	0	0	258	71	0	0	0	83	412
2010	0	0	59	0	0	0	0	59	118
2011	0	0	77	29	0	0	0	33	139
2012	0	0	118	74	0	0	0	17	209
2002–2011 Average	**0**	**0**	**176**	**86**	**0**	**0**	**0**	**119**	**381**
2007–2011 Average	**0**	**0**	**131**	**55**	**0**	**0**	**0**	**120**	**306**

	Catch								
Year	Nome	Pilgrim	Unalakleet	Fish-Niukluk	Sinuk	Snake	Solomon	Other	Total
1993	175	254	515	945	28	37	0	265	2,219
1994	36	146	561	1,271	22	37	7	482	2,562
1995	478	232	966	428	44	189	22	525	2,884
1996	432	133	1,589	1,660	200	111	0	550	4,675
1997	113	15	1,323	714	160	9	0	495	2,829
1998	8	44	2,218	822	0	0	0	1,746	4,838
1999	0	0	1,916	265	0	0	0	234	2,415
2000	20	24	3,652	952	12	0	278	781	5,719
2001	13	11	2,030	543	0	78	0	5,857	8,532
2002	220	0	1,653	747	23	0	81	2,132	4,856
2003	0	548	1,681	258	14	0	0	303	2,804
2004	14	33	1,473	979	149	14	0	1,168	3,830
2005	0	64	1,822	177	477	54	0	675	3,269
2006	122	0	1,628	0	709	116	11	300	2,886
2007	121	128	554	190	91	15	105	1,842	3,046
2008	157	0	4,055	277	120	92	204	1,056	5,961
2009	0	0	1,885	71	8	0	0	149	2,113
2010	53	0	2,127	501	52	0	0	124	2,857
2011	13	0	3,944	144	0	17	101	84	4,303
2012	111	0	2,583	190	0	0	0	17	2,901
2002–2011 Average	**70**	**77**	**2,082**	**334**	**164**	**31**	**50**	**783**	**3,593**
2007–2011 Average	**69**	**26**	**2,513**	**237**	**54**	**25**	**82**	**651**	**3,656**

Table 11.–Dolly Varden and Arctic char sport harvest in the NW/NSMA by subarea and river, 1993–2012.

	Seward Peninsula/Norton Sound Harvest										Kotzebue/Chukchi Sea Harvest						
Year	Salt Water	Nome River	Pilgrim River	Unalakleet River	Fish-Niukluk River	Sinuk River	Snake River	Solomon River	Other Streams/ Lakes	Total	Salt Water	Kobuk River	Noatak River	Wulik River	Other Streams/ Lakes	Total	Grand Total
1993	205	917	448	427	1,003	536	331	893	1,147	5,907	0	9	325	263	317	914	6,821
1994	90	431	63	410	699	305	117	197	759	3,071	27	132	786	858	562	2,365	5,436
1995	0	462	74	976	346	158	131	366	395	2,908	22	28	124	389	287	850	3,758
1996	12	873	388	1,506	402	485	97	49	473	4,285	0	172	632	85	109	998	5,283
1997	189	328	65	936	2,071	346	81	186	265	4,467	22	11	103	252	344	732	5,199
1998	0	302	14	588	160	311	0	383	482	2,240	0	49	175	200	216	640	2,880
1999	330	791	45	2,384	1,952	88	44	154	920	6,708	0	49	255	312	492	1,108	7,816
2000	1,069	340	0	4,462	1,687	59	199	0	136	7,952	281	47	763	348	508	1,947	9,899
2001	166	43	270	1,002	1,197	86	108	162	140	3,174	108	79	1,026	430	480	2,123	5,297
2002	67	511	72	789	259	47	18	18	471	2,252	18	197	1,495	138	174	2,022	4,274
2003	0	1,223	482	134	110	712	13	0	2,857	5,531	0	29	354	137	150	670	6,201
2004	72	226	0	3,593	120	42	0	53	212	4,318	0	642	69	148	574	1,433	5,751
2005	95	553	12	500	1,148	141	27	0	141	2,617	0	0	63	176	176	415	3,032
2006	0	959	0	1,307	0	531	51	153	179	3,180	116	71	1,075	989	1,066	3,317	6,497
2007	14	625	0	731	193	144	461	481	159	2,808	20	29	2,379	372	496	3,296	6,104
2008	0	46	0	1,062	1,061	107	46	0	997	3,319	0	0	640	117	212	969	4,288
2009	0	253	0	2,794	108	50	50	0	118	3,373	17	197	853	272	305	1,644	5,017
2010	0	165	0	1,411	12	117	0	24	106	1,835	348	12	59	59	15	493	2,328
2011	0	0	11	2,219	1,631	0	10	0	170	4,041	0	16	503	185	161	865	4,906
2012	0	111	0	88	0	9	33	0	11	252	0	35	587	159	0	781	1,033
2002–2011 Average	**25**	**456**	**58**	**1,454**	**464**	**189**	**68**	**73**	**541**	**3,327**	**52**	**119**	**749**	**259**	**333**	**1,512**	**4,840**
2007–2011 Average	**3**	**218**	**2**	**1,643**	**601**	**84**	**113**	**101**	**310**	**3,075**	**77**	**51**	**887**	**201**	**238**	**1,453**	**4,529**

Table 12.–Dolly Varden and Arctic char sport catch in the NW/NSMA by subarea and river, 1993–2012.

	Seward Peninsula/Norton Sound Catch										Kotzebue/Chukchi Sea Catch						
Year	Salt Water	Nome River	Pilgrim River	Unalakleet River	Fish-Niukluk River	Sinuk River	Snake River	Solomon River	Other Streams/ Lakes	Total	Salt Water	Kobuk River	Noatak River	Wulik River	Other Streams/ Lakes	Total	Grand Total
1993	205	5,153	2,736	964	5,838	1,179	1,003	1,725	3,246	22,166	106	858	3,526	1,784	916	7,190	29,356
1994	90	631	152	1,253	2,116	830	420	448	1,394	7,334	27	379	4,618	3,413	2,296	10,733	18,067
1995	115	1,474	218	2,732	640	723	507	734	778	7,921	22	1,962	1,427	2,106	2,287	7,804	15,725
1996	12	1,311	509	3,073	1,872	618	255	49	1,104	8,803	12	661	1,203	1,953	1,547	5,376	14,179
1997	189	873	254	4,400	9,952	1,249	243	415	1,773	19,348	108	311	1,849	3,599	1,479	7,346	26,694
1998	0	319	41	2,336	1,180	311	0	410	1,426	6,023	16	259	2,861	5,132	338	8,606	14,629
1999	486	1,486	585	10,460	5,601	198	257	573	2,773	22,419	0	262	2,856	3,061	2,080	8,259	30,678
2000	1,195	429	0	10,222	2,250	95	199	1,511	2,384	18,285	281	2,094	1,721	2,345	1,524	7,965	26,250
2001	166	94	439	2,769	3,053	108	108	399	1,411	8,547	108	79	1,595	2,934	0	4,766	13,313
2002	67	543	75	2,593	800	74	18	18	3,820	8,008	18	1,415	1,619	2,139	1,342	6,552	14,560
2003	12	1,276	549	4,284	1,561	840	27	0	5,872	14,421	0	347	728	3,118	99	4,292	18,713
2004	269	374	80	10,928	849	42	0	67	1,587	14,196	0	1,701	503	844	729	3,777	17,973
2005	95	992	59	3,299	2,688	294	423	0	2,231	10,081	0	0	429	2,260	726	3,415	13,496
2006	0	1,947	64	2,986	67	2,767	115	230	2,188	10,364	154	563	2,686	4,001	586	7,990	18,354
2007	14	754	0	4,763	1,852	1,695	481	560	1,222	11,341	50	159	4,601	800	124	5,734	17,075
2008	15	107	0	7,154	1,926	595	61	12	3,723	13,593	0	17	2,748	3,143	733	6,641	20,234
2009	0	629	0	12,746	348	394	16	282	1,931	16,346	17	255	3,380	2,507	65	6,224	22,570
2010	0	224	29	6,987	307	161	0	24	428	8,160	447	144	629	396	59	1,675	9,835
2011	0	0	11	4,837	1,692	0	74	17	697	7,328	0	46	935	956	1,329	3,266	10,594
2012	220	271	0	4,350	280	202	113	0	44	5,480	0	134	873	430	0	1,437	6,917
2002–2011 Average	**47**	**685**	**87**	**6,058**	**1,209**	**686**	**122**	**121**	**2,370**	**11,384**	**69**	**465**	**1,826**	**2,016**	**581**	**4,957**	**16,340**
2007–2011 Average	**6**	**343**	**8**	**7,297**	**1,225**	**569**	**126**	**179**	**1,600**	**11,354**	**103**	**124**	**2,459**	**1,560**	**462**	**4,708**	**16,062**

Table 13.–Aerial counts of Dolly Varden spawning in the Noatak River and overwintering in the Wulik and Kivalina rivers, 1991–2012.

	Spawners	Nonspawners	
Year	Noatak River	Wulik River	Kivalina River
1991	9,605	126,985	35,275
1992	ND	135,135	ND
1993	9,560	144,138	16,534
1994	ND	66,752	ND
1995	6,500	128,705	28,870
1996	12,184	61,005	ND
1997	ND	95,412	ND
1998	ND	104,043	ND
1999	9,636	70,704	ND
2000	ND	ND	ND
2001	ND	92,614	ND
2002	3,655	44,257	ND
2003	ND	ND	ND
2004	ND	101,806	ND
2005	ND	120,848	ND
2006	ND	108,352	ND
2007	ND	99,311	ND
2008	ND	71,463	ND
2009	ND	63,997	ND
2010	ND	36,866	ND
2011	ND	64,499	ND
2012	ND	21,084	ND

Note: ND indicates years in which no aerial surveys were conducted.

Table 14.–Arctic grayling sport harvest and catch in Seward Peninsula/Norton Sound rivers, 1993–2012.

	Harvest								
Year	Nome	Pilgrim	Unalakleet	Fish-Niukluk	Sinuk	Snake	Solomon	Other	Total
1993	0	75	131	585	37	467	0	289	1,584
1994	16	49	353	506	8	32	0	236	1,200
1995	0	52	291	404	18	18	0	254	1,037
1996	0	73	420	313	97	121	0	461	1,485
1997	0	81	210	734	0	0	0	236	1,261
1998	0	0	144	16	8	8	0	122	298
1999	0	11	277	1,029	11	113	0	159	1,600
2000	0	58	538	442	0	16	0	149	1,203
2001	0	43	247	430	43	63	0	168	994
2002	0	31	773	452	103	110	0	96	1,565
2003	0	98	131	387	12	140	0	1,010	1,778
2004	0	0	579	102	0	91	0	52	824
2005	0	0	32	402	16	33	0	112	595
2006	0	83	60	0	138	0	0	138	419
2007	0	26	10	12	77	141	0	48	314
2008	0	0	346	322	0	34	0	263	965
2009	0	0	457	456	34	0	0	256	1,169
2010	0	0	148	0	68	0	0	16	232
2011	0	0	10	1342	0	28	0	18	1,398
2012	0	32	0	421	0	67	0	0	520
2002–2011 Average	**0**	**24**	**255**	**348**	**45**	**58**	**0**	**201**	**926**
2007–2011 Average	**0**	**5**	**194**	**426**	**36**	**41**	**0**	**120**	**816**

	Catch								
Year	Nome	Pilgrim	Unalakleet	Fish-Niukluk	Sinuk	Snake	Solomon	Other	Total
1993	569	2,362	874	5,976	879	1,614	140	809	13,223
1994	1,111	266	1,639	2,389	417	377	212	670	7,081
1995	571	370	1,471	1,169	498	887	200	622	5,788
1996	497	821	1,694	4,653	339	1,055	97	1,250	10,406
1997	569	429	4,918	10,452	1,464	123	703	1,529	20,187
1998	207	65	3,256	8,159	25	218	0	1,570	13,500
1999	300	694	6,089	7,414	22	723	21	869	16,132
2000	10	221	6,814	1,701	29	449	853	992	11,069
2001	60	403	2,331	3,972	218	1,385	0	1,098	9,467
2002	735	144	4,229	6,587	432	279	0	351	12,757
2003	94	397	6,189	5,495	249	559	80	1,954	15,017
2004	113	0	3,478	1,594	0	238	130	533	6,086
2005	92	48	1,137	3,316	171	338	161	112	5,375
2006	560	220	669	311	1,331	262	83	794	4,230
2007	61	26	2,375	3,287	902	260	0	937	7,848
2008	183	13	3,497	4,073	84	234	0	1,659	9,743
2009	214	0	4,497	6,458	352	364	13	1,724	13,257
2010	28	93	3,304	3,659	348	55	0	146	7,633
2011	0	0	1,937	2,588	0	671	0	18	5,214
2012	9	250	3,442	4,098	0	401	0	0	8,200
2002–2011 Average	**208**	**94**	**3,131**	**3,737**	**387**	**326**	**47**	**823**	**8,716**
2007–2011 Average	**97**	**26**	**3,122**	**4,013**	**337**	**317**	**3**	**897**	**8,739**

Table 15.–Arctic grayling sport harvest and catch in the Kotzebue Sound/Chukchi Sea subarea, 1993–2012.

	Harvest				
Year	Kobuk River	Noatak River	Other Streams	Lakes	Total
1993	305	322	234	55	916
1994	178	407	186	33	804
1995	383	185	263	79	910
1996	513	1,136	393	94	2,136
1997	476	872	555	0	1,903
1998	1,729	42	0	17	1,788
1999	672	412	97	66	1,247
2000	836	223	45	129	1,233
2001	355	620	111	158	1,244
2002	1,674	79	233	8	1,994
2003	781	528	129	35	1,473
2004	1,157	317	509	0	1,983
2005	231	38	0	6	275
2006	172	301	270	17	760
2007	307	433	32	64	836
2008	47	232	14	0	293
2009	143	208	35	53	439
2010	214	52	100	0	366
2011	183	238	65	0	486
2012	64	545	17	0	626
2002–2011 Average	**491**	**243**	**139**	**18**	**891**
2007–2011 Average	**179**	**233**	**49**	**23**	**484**
	Catch				
Year	Kobuk River	Noatak River	Other Streams	Lakes	Total
1993	1,717	1,718	3,151	642	7,228
1994	1,593	842	2,653	374	5,462
1995	5,146	1,114	7,921	1,560	15,741
1996	2,469	3,886	3,516	1,306	11,177
1997	2,815	2,179	3,182	216	8,392
1998	5,280	964	548	404	7,196
1999	6,680	3,621	5,114	66	15,481
2000	5,753	1,668	1,934	376	9,731
2001	4,103	2,123	975	171	7,372
2002	18,080	452	2,703	460	21,695
2003	5,860	3,875	658	233	10,626
2004	8,369	652	1,274	0	10,295
2005	1,639	435	826	0	2,900
2006	2,328	1,827	2,735	17	6,907
2007	2,191	1,965	32	1,975	6,163
2008	301	1,722	1,805	112	3,940
2009	4,065	2,542	509	53	7,169
2010	1,540	1,559	1,102	0	4,201
2011	1,054	609	722	0	2,385
2012	701	1,623	335	0	2,659
2002–2011 Average	**4,543**	**1,564**	**1,237**	**285**	**7,628**
2007–2011 Average	**1,830**	**1,679**	**834**	**428**	**4,772**

Table 16.–Sport fish harvest and catch of sheefish from northwest Alaska waters, 1993–2012.

	Total Harvest			Kobuk River			Selawik River		
Year	Harvest	Catch	% Harvested	Harvest	Catch	% Harvested	Harvest	Catch	% Harvested
1993	1,029	2,273	45	395	1,074	37	111	111	100
1994	564	958	59	135	386	35	95	95	100
1995	1,142	3,270	35	748	2,669	28	38	47	81
1996	485	3,183	15	360	2,850	13	94	271	35
1997	906	2,341	39	318	1,334	24	108	108	100
1998	414	924	45	145	617	24	148	186	80
1999	635	5,134	12	621	5,070	12	ND	ND	ND
2000	1,201	3,372	36	362	2,338	16	0	0	0
2001	1,305	5,146	25	552	4,105	13	0	0	0.0
2002	500	1,996	25	352	1,710	21	119	239	50
2003	2,509	7,324	34	676	4,517	15	59	59	100
2004	1,634	2,837	58	477	1,575	30	58	58	100
2005	393	1,043	38	393	1,043	37	0	0	0
2006	810	5,254	15	566	4,929	12	0	0	0
2007	1,066	1,639	65	742	1,283	58	0	0	0
2008	61	482	13	0	209	0	0	0	0
2009	946	5,050	19	747	4,474	17	0	0	0
2010	595	2,928	20	86	1,910	5	221	368	60
2011	385	647	60	257	455	57	0	0	0
2012	104	259	40	50	205	24	0	0	0
2002–2011 Average	**890**	**2,920**	**35**	**430**	**2,211**	**25**	**46**	**72**	**31**
2007–2011 Average	**611**	**2,149**	**35**	**366**	**1,666**	**27**	**44**	**74**	**12**

Table 17.–Sport fishing effort, catch, and harvest of lake trout, Dolly Varden/Arctic char, and Arctic grayling in the North Slope subarea, 1993–2012.

Year	Angler-days		Lake trout		Dolly Varden/Arctic char		Arctic grayling	
	Total	Haul Road	Total	Haul Road	Total	Haul Road	Total	Haul Road
				Harvest				
1993	5,600	3,421	106	57	1,092	623	1,632	547
1994	5,407	2,926	73	73	589	451	807	371
1995	5,644	3,275	38	38	896	437	983	579
1996	4,487	2,700	19	0	1,108	547	1,194	619
1997	5,278	3,224	57	34	1,018	413	903	426
1998	3,653	2,121	221	129	1,454	1,071	1,182	604
1999	5,230	2,473	77	0	929	341	1,206	365
2000	4,739	2,325	18	18	1,178	267	934	370
2001	6,032	4,256	37	0	1,589	1,006	846	510
2002	6,032	2,224	217	0	773	266	2,215	590
2003	2,710	1,103	98	0	193	0	1,122	263
2004	3,311	873	75	0	180	105	868	103
2005	4,352	1,881	96	0	493	99	1,313	810
2006	3,104	1,298	10	0	304	170	235	131
2007	4,154	1,873	0	0	151	130	572	293
2008	5,599	3,774	0	0	352	179	810	754
2009	3,905	1,813	0	0	919	98	2,996	454
2010	4,384	3,746	117	0	223	167	608	474
2011	2,931	1,801	0	0	339	207	320	165
2012	5,057	2,516	112	0	594	280	892	424
2002–2011 Average	**4,098**	**2,039**	**61**	**0**	**393**	**158**	**1,106**	**404**
2007–2011 Average	**4,195**	**2,601**	**23**	**0**	**397**	**156**	**1,061**	**428**

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Table 17.–Page 2 of 2.

Year	Angler-days		Lake trout		Dolly Varden/Arctic char		Arctic grayling	
	Total	Haul Road	Total	Haul Road	Total	Haul Road	Total	Haul Road
				Catch				
1993	5,600	3,421	266	180	3,946	2,454	9,345	5,505
1994	5,407	2,926	327	316	3,178	2,371	8,552	5,165
1995	5,644	3,275	370	319	3,229	1,780	5,427	3,828
1996	4,487	2,700	298	159	8,06	6,933	7,456	4,708
1997	5,278	3,224	783	67	4,094	1,433	16,248	12,524
1998	3,653	2,121	1,292	269	7,716	4,166	7,529	4,862
1999	5,230	2,473	913	55	4,520	497	9,956	4,875
2000	4,739	2,325	457	457	7,579	2,561	12,523	8,244
2001	6,032	4,256	266	87	6,027	3,244	7,035	5,413
2002	6,032	2,224	410	54	2,195	433	9,374	4,767
2003	2,710	1,103	1,164	103	936	398	7,944	3,326
2004	3,311	873	540	163	803	345	7,014	2,525
2005	4,352	1,881	433	288	1,756	621	12,270	7,769
2006	3,104	1,298	850	401	1,930	53	3,648	759
2007	2,975	1,789	183	183	1,941	1631	8,142	6,463
2008	5,599	3,774	21	21	4,426	1,210	9,293	6,160
2009	3,905	1,813	67	67	3,165	1,187	10,452	5,810
2010	4,834	3,746	246	129	3,010	2,718	11,484	10,736
2011	2,931	1,801	0	0	6,689	5,365	5,076	2,797
2012	5,057	2,516	223	93	4,973	3,072	14,600	12,903
2002–2011 Average	**3,975**	**2,030**	**391**	**141**	**2,685**	**1,479**	**8,470**	**5,267**
2007–2011 Average	**4,049**	**2,585**	**103**	**80**	**3,846**	**2,422**	**8,889**	**6,393**

Table 18.–Aerial survey indices of Dolly Varden from the Ivishak, Anaktuvuk, and Kongakut rivers of the North Slope subarea, 1971–2012.

Year	Date	Ivishak River	Anaktuvuk River	Kongakut River	Survey Method	Survey Rating	Data Source
1971	22-Sept	24,470	ND	ND	H	Good	Yoshihara 1973
1972	24-Sept	11,937	ND	ND	H	Good	Yoshihara 1972
1973	11-Sept	8,992	ND	ND	H	Excellent	Furniss 1975
1974	10-Sept	11,000	ND	ND	H	Not Rated	Furniss 1975
1975	22-Sept	8,306	ND	ND	H	Not Rated	Bendock 1982
1976	22-Sept	8,570	ND	ND	H	Fair	Bendock 1982
1977	NS	ND	ND	ND	ND	ND	ND
1978	NS	ND	ND	ND	ND	ND	ND
1979	22-Sept	24,403	15,717	ND	S	Excellent	Bendock 1980
1980	NS	ND	ND	ND	ND	ND	ND
1981	22-Sept	24,873	10,536	ND	S	Excellent	Bendock 1982
1982	22-Sept	36,432	6,222	ND	S	Excellent	Bendock 1983
1983	22-Sept	27,820	8,743	ND	S	Excellent	Bendock and Burr 1984
1984	22-Sept	24,818	5,462	ND	S	Excellent	Bendock and Burr 1985
1985	NS	ND	ND	ND	ND	ND	ND
1986	ND	ND	ND	8,900	H	Unknown	Millard USFWS files[a]
1987	NS	ND	ND	ND	ND	ND	ND
1988	NS	ND	ND	ND	ND	ND	ND
1989	22-Sept	12,650	ND	6,355	H	Good	DeCicco ADF&G files[a]
1990	NS	ND	ND	ND	ND	ND	ND
1991	NS	ND	ND	ND	ND	ND	ND
1992	NS	ND	ND	ND	ND	ND	ND
1993	3-Sept	3,057	ND	ND	H	Good	Millard USFWS files[a]
1994	NS	ND	ND	ND	ND	ND	ND
1995	27-Sept	27,036	ND	14,080	H	Good	Burr ADF&G files[a]

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Table 18–Page 2 of 2.

Year	Date	Ivishak River	Anaktuvuk River	Kongakut River	Survey Method	Survey Rating	Data Source
2000	22-Sept	4,530[b]	ND	ND	H	Excellent	Viavant 2001
2001	22-Sept	10,932[c]	ND	ND	H	Excellent	Viavant 2002
2002	22-Sept	5,408[c]	4,800	ND	H	Excellent	Viavant 2003
2003	22-Sept	2,720[c]	ND	ND	H	Good	Viavant 2005
2004	ND	ND	ND	ND	ND	ND	ND
2005	ND	ND	ND	ND	ND	ND	ND
2006	22-Sept	5,411[c]	5,477	ND	H	Good	Viavant ADF&G files[a]
2007[d]	19-Sept	6,520	5,807	ND	H	Good	Viavant ADF&G files[a]
2008[e]	24-Sept	11,914	9,660	ND	H	Excellent	Viavant ADF&G files[a]
2009	ND	ND	ND	ND	ND	ND	ND
2010	ND	ND	ND	ND	ND	ND	ND
2011	ND	ND	ND	ND	ND	ND	ND
2012	ND	ND	ND	ND	ND	ND	ND

Note: NS = no survey, H = helicopter, S = fixed-wing aircraft (Super Club; PA-18).

[a] M. Millard, Fishery Biologist, USFWS, Fairbanks, personal communication; F. DeCicco, SF Biologist, ADF&G, Fairbanks, personal communication; J. Burr, SF Biologist, ADF&G, Fairbanks, personal communication; T. Viavant, SF Biologist, ADF&G, Fairbanks, personal communication.

[b] 3.7 mi (6 km) reach based on multiple aerial surveys.

[c] Complete 17.4 mi (28 km) index area, based on multiple aerial surveys September 18–22.

[d] 3,936 fish were counted on the Canning River, and 9,575 fish were counted on the Hulahula River in 2007

[e] 7,533 fish were counted on the Canning River, and 3,652 fish were counted on the Hulahula River in 2008

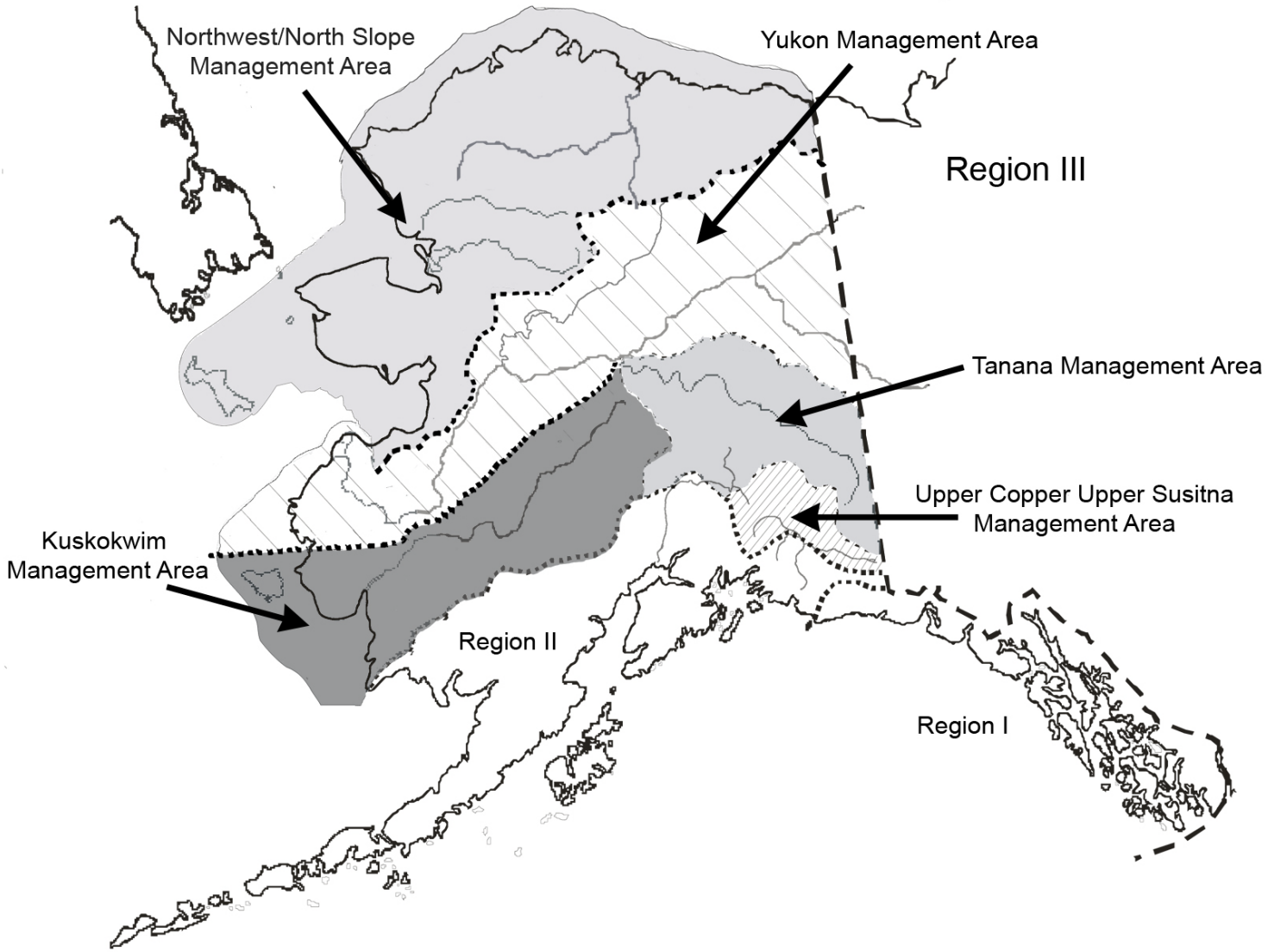

Figure 1.–Map of the sport fish regions in Alaska and the 5 Region III management areas.

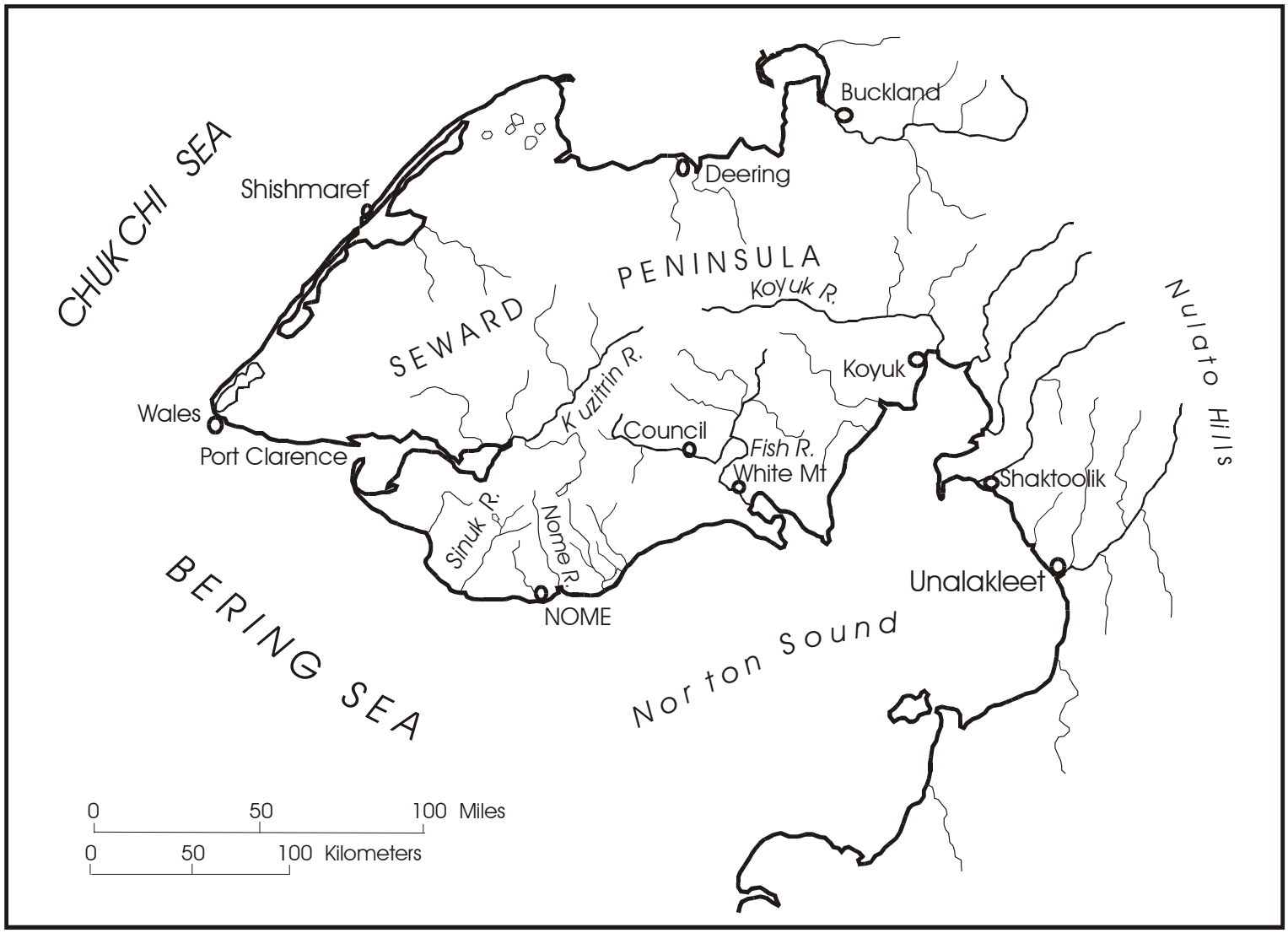

Figure 2.–The Seward Peninsula/Norton Sound subarea.

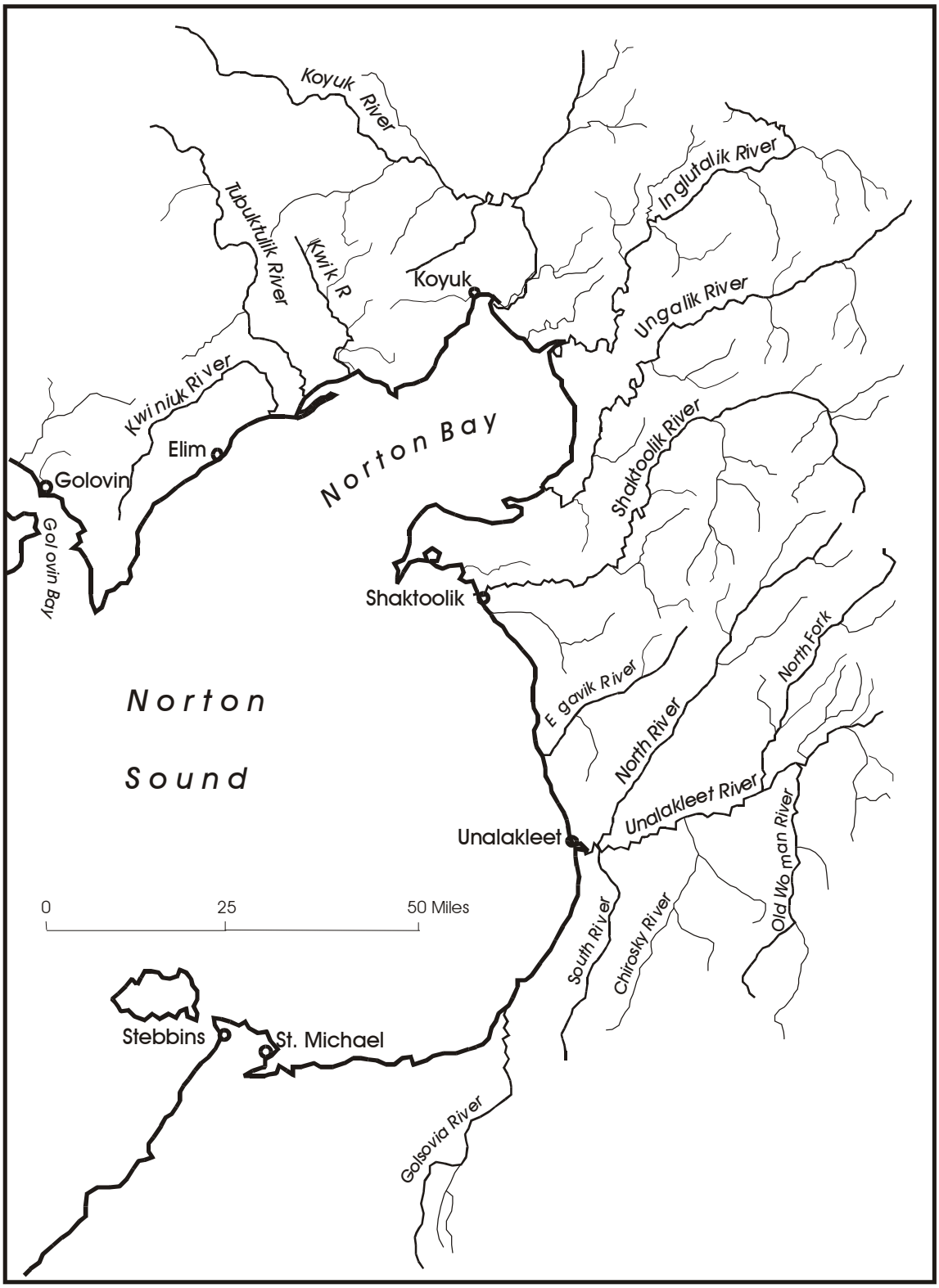

Figure 3.–Major drainages of Southern Norton Sound.

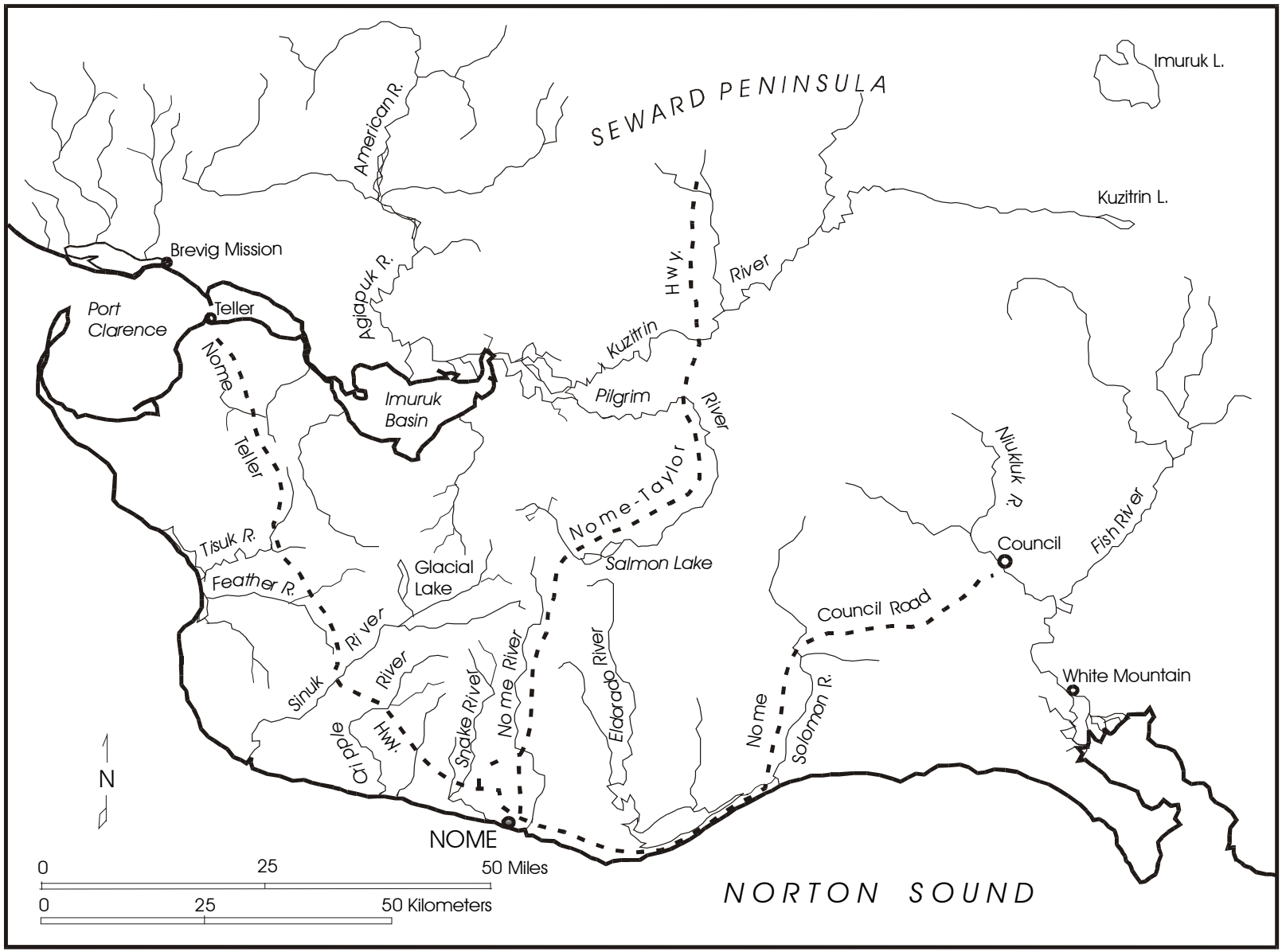

Figure 4.–Southern Seward Peninsula with road-accessible waters.

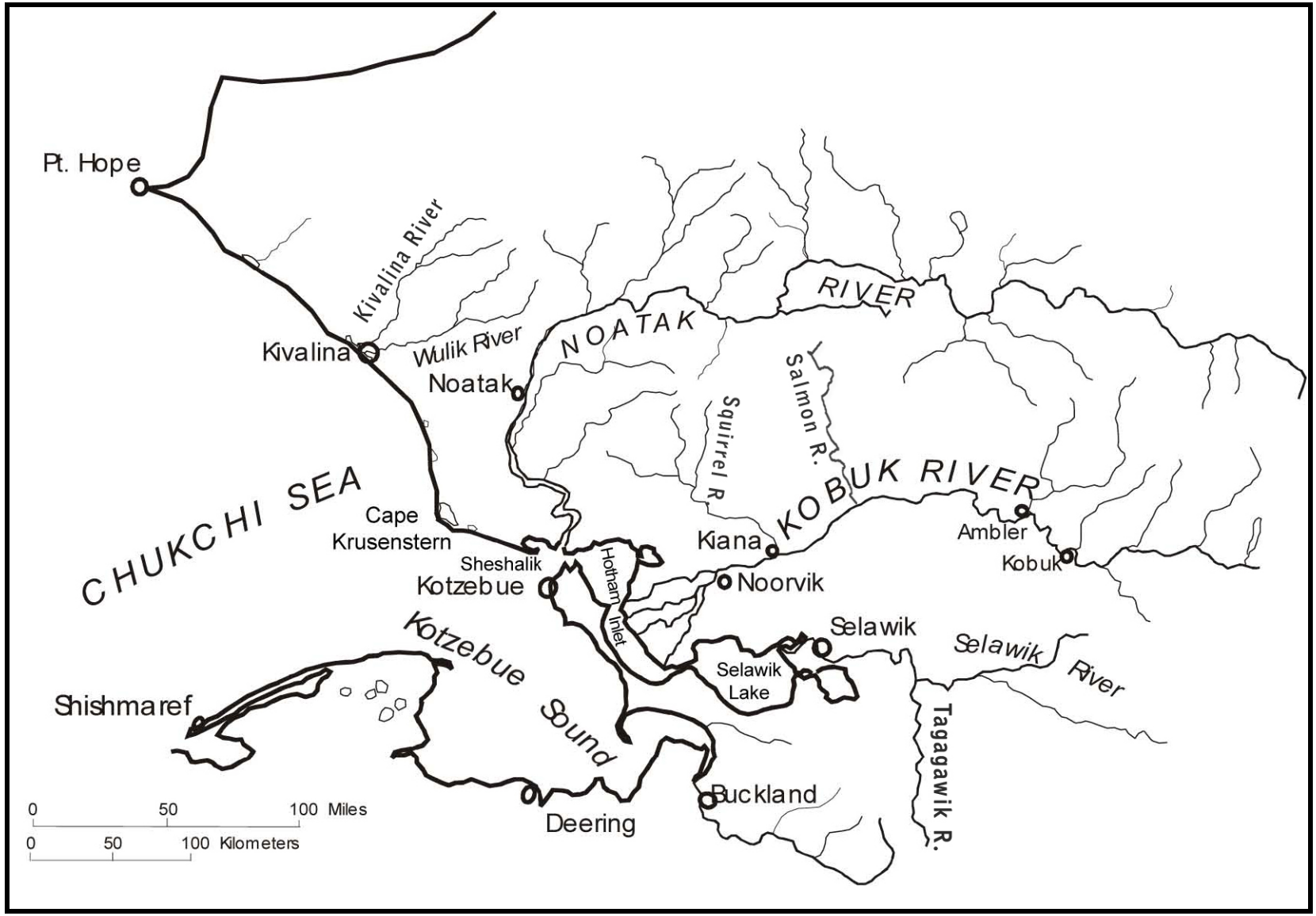

Figure 5.–Kotzebue Sound/Chukchi Sea subarea.

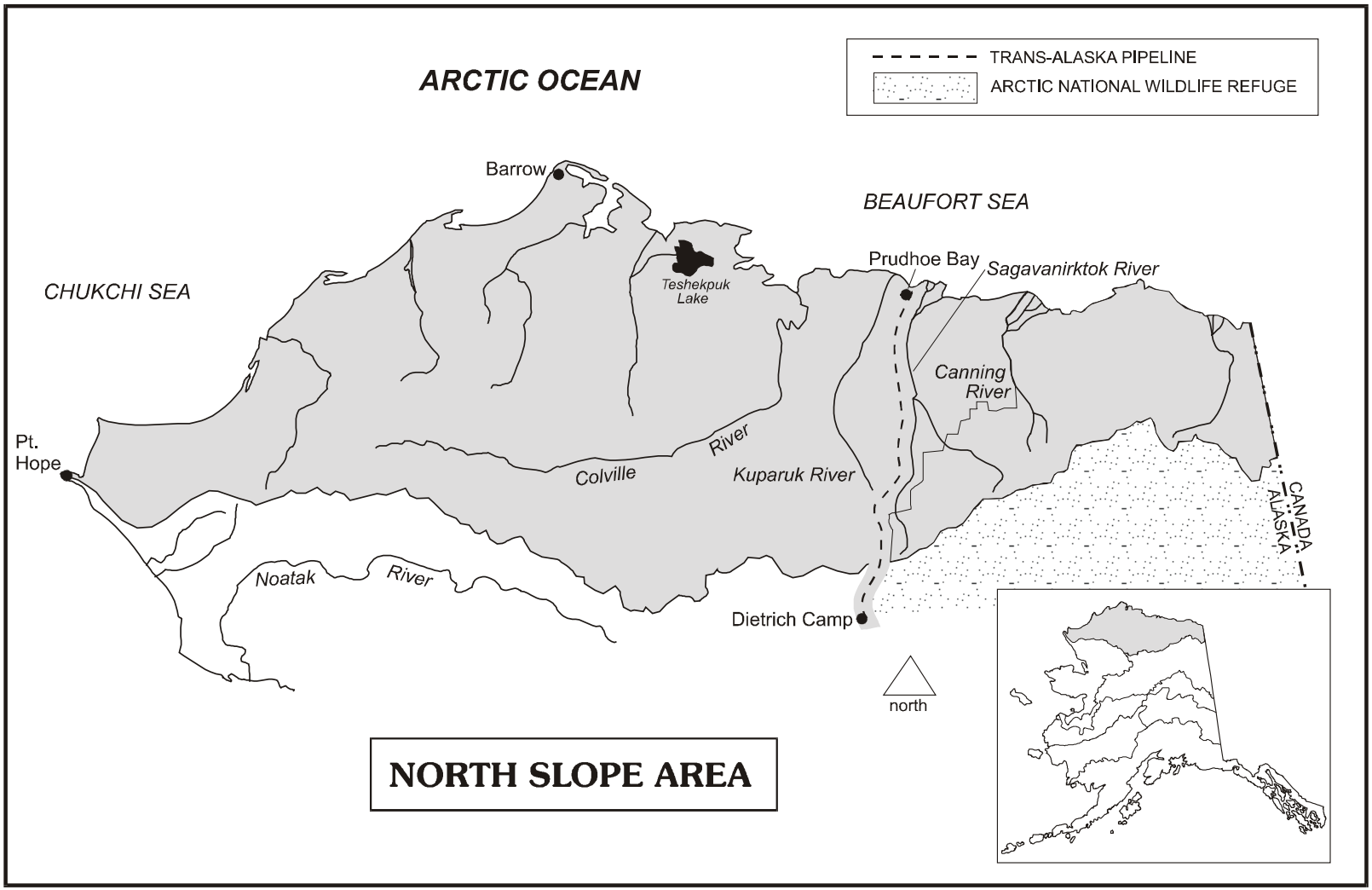

Figure 6.–North Slope subarea.

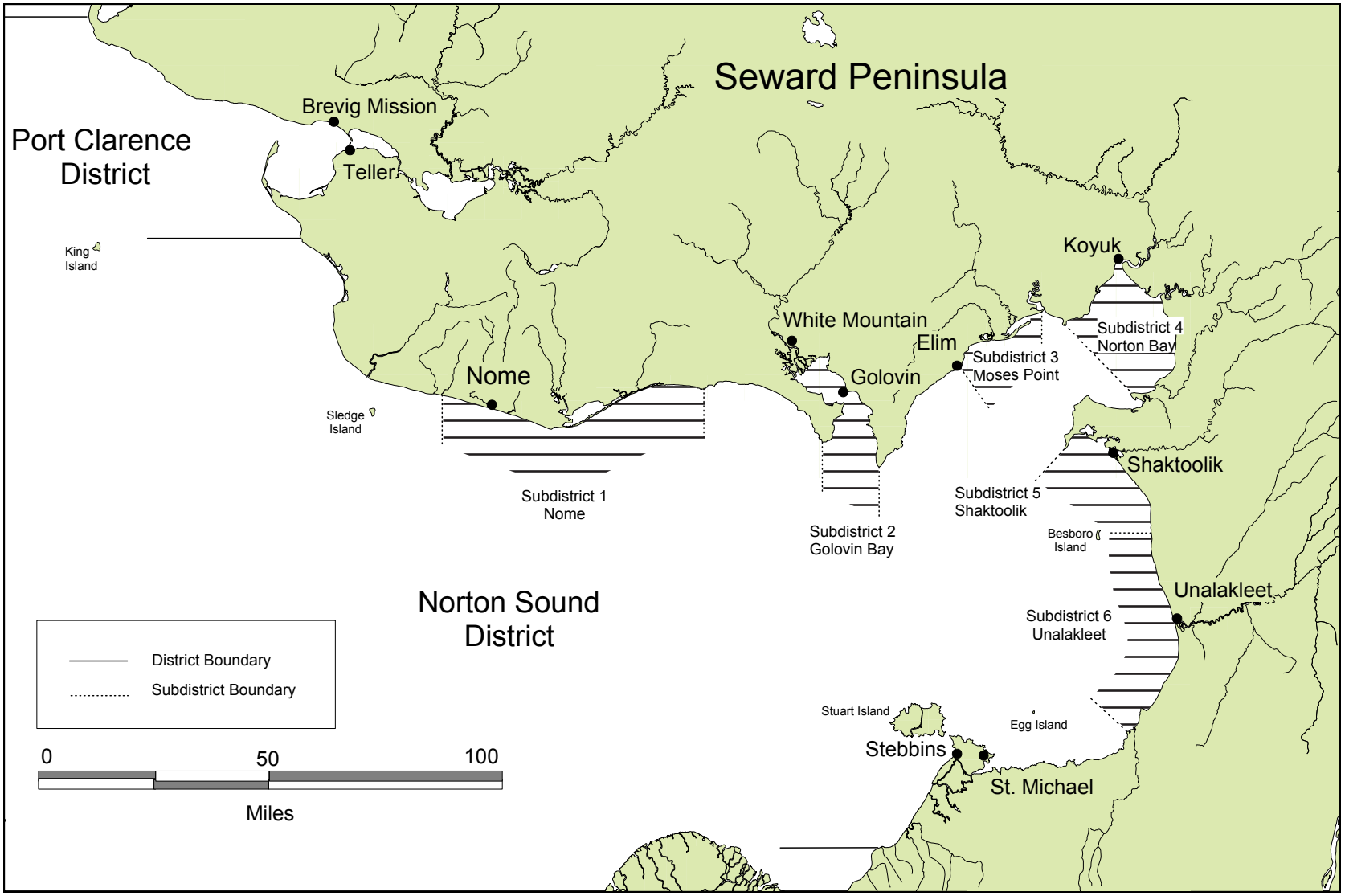

Figure 7.–Commercial salmon fishing subdistricts in Norton Sound and Port Clarence.

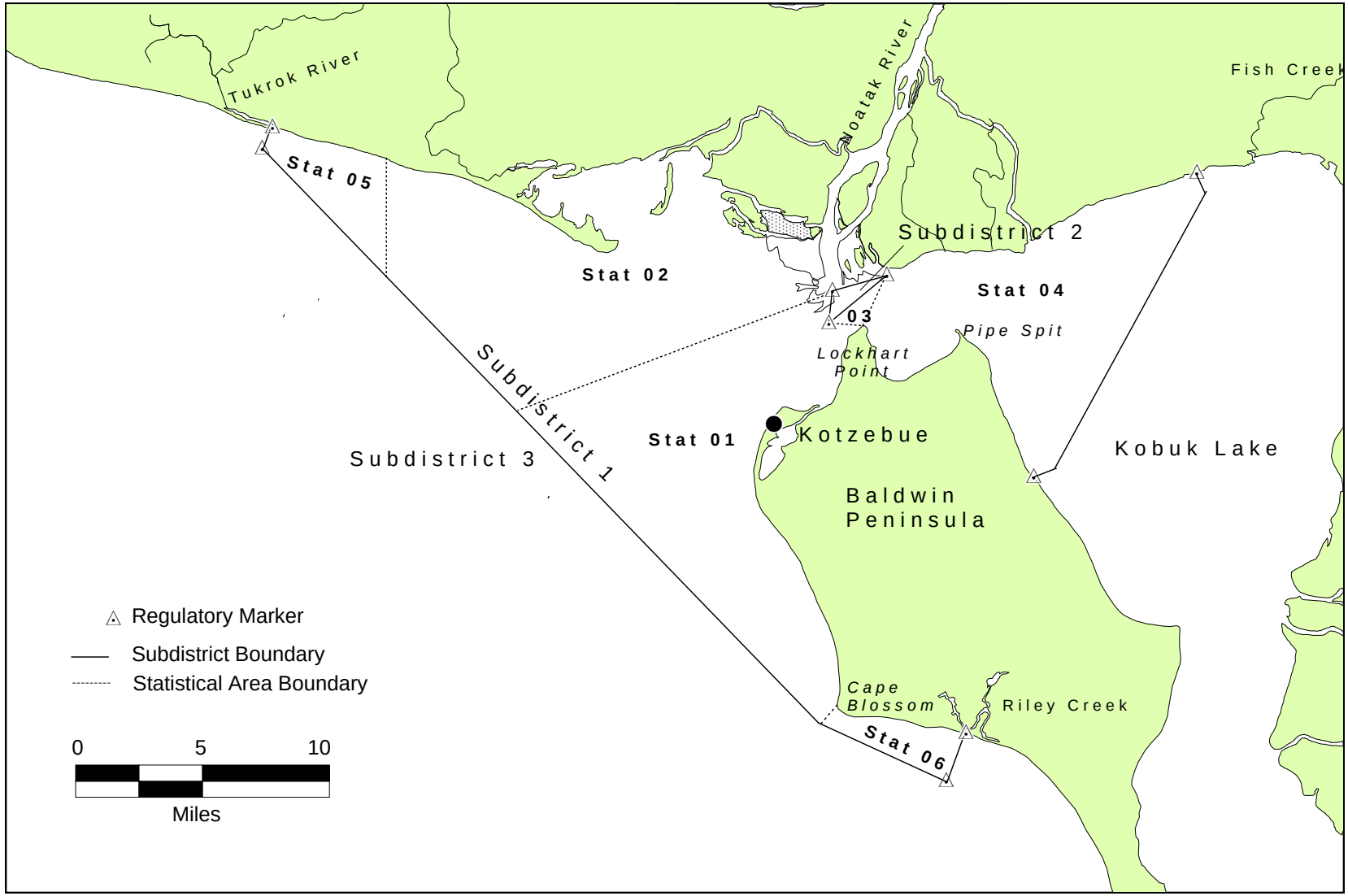

Figure 8.–Kotzebue commercial salmon fishing district.

APPENDIX A: SPORT FISH EMERGENCY ORDERS ISSUED DURING 2012

Appendix A1.–NW/NSMA sport fish emergency orders issued during 2012.

EO Number	Effective Dates	Action
EO-3KS-06-12	July 11–August 15	Closes sport fishing for king salmon and prohibits the use of bait in the Unalakleet and Shaktoolik river drainages

APPENDIX B: ADDRESSES AND CONTACT NUMBERS FOR INFORMATION SOURCES REGARDING NW/NSMA

Appendix B1.-Addresses and contact numbers for information sources regarding NW/NSMA.

Organization	Address	Phone	Internet address
Alaska Department of Fish and Game, Nome Area office	PO Box 1148 Nome, AK 99762	(800) 443-5167	www.adfg.alaska.gov
ADF&G Fairbanks Regional office	1300 College Road Fairbanks, AK 99701-1599	(907) 459-7207	www.adfg.alaska.gov
Gates of the Arctic National Park and Preserve	PO Box 30 Bettles, AK 99726	(907) 692-5494	www.nps.gov/gaar/
Arctic National Wildlife Refuge	101 12th Avenue, Room 236 Fairbanks, AK 99701	(907) 456-0250	arctic.fws.gov/
Bering Land Bridge National Preserve	PO Box 220 Nome, AK 99762	(907) 443-2522	www.nps.gov/bela/
Alaska Maritime National Wildlife Refuge	95 Sterling Highway, Suite 1 MS 505 Homer, Alaska 99603	(907) 235-6546	alaskamaritime.fws.gov/
Noatak National Preserve	PO Box 1029 Kotzebue, AK 99752	(907) 442-3890	www.nps.gov/noat/
Kobuk Valley National Park	PO Box 1029 Kotzebue, AK 99752	(907) 442-3890	www.nps.gov/kova/
Selawik National Wildlife Refuge	PO Box 270 MS 565 Kotzebue, Alaska 99752	(907) 442-3799	selawik.fws.gov/
Cape Krusenstern National Monument	PO Box 1029 Kotzebue, AK 99752	(907) 442-3890	www.nps.gov/cakr
Unalakleet National Wild and Scenic River	222 West 7th Avenue, #13 Anchorage, AK 99513	(907) 271-5477	www.blm.gov/ak/ado/unkriver.html
NANA Regional Corporation	PO Box 49 Kotzebue, AK 99752	(800) 478-3301	www.nana.com
Nome Eskimo Community	PO Box 1090 Nome, Alaska 99762	(907) 443-2246	www.necalaska.org/
Unalakleet IRA Council	PO Box 270 Unalakleet, Alaska 99684	(907) 624-3622	http://www.kawerak.org/communities/unalakleet.html
Norton Sound Economic Development Corporation	PO Box 358 Nome, AK 99762	(888) 650-2477	www.nsedc.com